The Engineering and Mining Journal

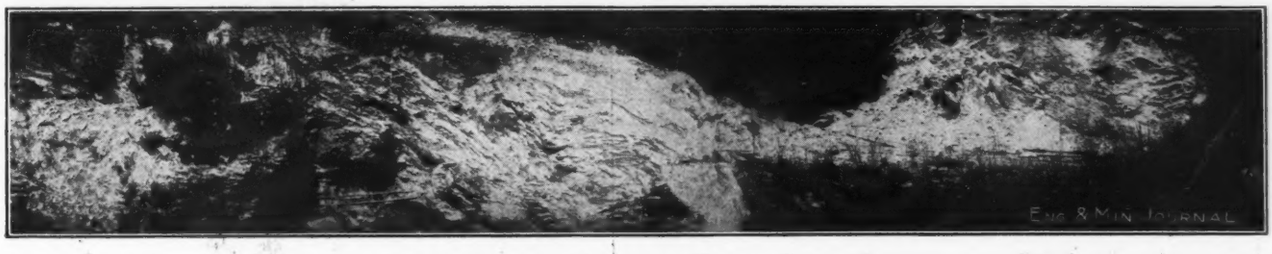
VOLUME 96 OCTOBER 4, 1913 NUMBER 14

Pyrophyllite in North Carolina

By Claud Hafer*

SYNOPSIS—Pyrophyllite is mined in North Carolina, but on a smaller scale than would seem justified. It is used as talc, although it is a silicate of aluminum, whereas talc is magnesium silicate. North Carolina is the only state in which this rock is mined, though New York is the seat of the principal talc industry. Several mills are in operation grinding pyrophyllite.

In the valley of Deep River, near Glendon, N. C., the mineral pyrophyllite occurs in such large quantities that its interesting features are not as a mineral, but as a rock formation of considerable area, as yet unexplored. Its extraction and preparation for commercial use is the basis of an industry that has been carried on since antebellum days when the "stone," as it was locally called, was carried down Deep River on flat boats to Fayetteville, where it was transferred to river steamers and shipped to northern markets.



Pyrophyllite Deposits, North Carolina

Sole Example of Pyrophyllite Mining in the United States

This is the only place in the United States where pyrophyllite is mined, and though its characteristics and uses are similar to those of talc, its composition is entirely different, being a silicate of aluminum, whereas talc is a magnesium silicate. Occurrences of the mineral are noted at the Brewer gold mine in South Carolina, and possibly at Gouverneur, N. Y., with true talc.[1] Dana's "Mineralogy" of 1857 mentions Cotton Stone Mountain, in Montgomery County, North Carolina, as a producing locality. Examination shows that this little mountain, which is a monadnock rising a few hundred feet above the surrounding country, contains an abundant quantity of mineral that at first sight seems to be wavellite, but may be radiating pyrophyllite. It is associated with quartz and is probably of no commercial value.

New York Most Important Talc-Mining State

The U. S. Geological Survey states that talc is a definite mineral, of which soapstone, as the term is generally used, is an impure massive form. Talc contains 63½% of silica and 31½% of magnesia, with about 4.8% of water. It has foliated structure, with pearly luster on its glazed face, greasy feel, and may be easily scratched by the thumb nail. The total marketed production of talc and soapstone in the United States during 1912 was 159,270 short tons, an increase of 10.95% as compared with the production of 1911. Rhode Island produces soapstone alone. The other states, except Maryland, North Carolina, Vermont and Virginia, produced talc only. The production of talc in the United States, California excepted, is limited to the belt of crystalline rock which extends, more or less continuously, through the Atlantic States from Vermont to Georgia. The relative rank of the producing states as to quantity and value of their production in 1912 is: New York, Vermont, Pennsylvania and New Jersey, Georgia, Maryland and Massachusetts, North Carolina, Virginia and finally California, in the order mentioned. New York continues to be the leading producer with an output of more than 52% of the total production of the United States, and far outranking all other states except Vermont, which has in recent years greatly increased its production.

Pyrophyllite Resembles Sericite

The Moore County, North Carolina, deposits were described in 1900 by Dr. J. H. Pratt, the state geologist of North Carolina. He says "the mineral is associated with the country slates, but is not in direct contact with them, being separated by bands of siliceous iron breccia,

*Mining engineer, Candor, N. C.

[1]J. S. Diller. "Production of Talc and Soapstone in 1912." U. S. Geological Survey.

100 to 150 ft. thick," and further that "the pyrophyllite rocks have a width of 500 ft., of which no more than 100 ft. constitute the workable deposits, with about 25% commercial pyrophyllite." In appearance and chemical composition this material does not differ greatly from the sericite deposits that occur so frequently in the gold-mining districts of North Carolina, and they are probably of similar origin, both being alteration products of the feldspar or mica present in the unaltered schist. The pyrophyllite evidently represents the further stage of alteration and its decomposition should give kaolin. In fact, a number of deposits of kaolin do exist in the region southwest of the "stone" country.

The various openings in the formation give evidence of much metamorphism, accompanied by folding and mashing. Veins of quartz, similar to the gold-bearing veins in the Candor gold district nearby, occur in the pyrophyllite. There are lenses and masses of vitreous quartz, in some cases heavily pyritic, with a little copper. Nearly all of the work done in this field has been open to daylight, there having been only a few shafts sunk, and a few shallow drifts from the opencuts to explore new territory. When new "shoots" were encountered, they were stoped out to the surface. The mineral lies comparatively flat, dipping from 20° to 40° from the horizontal, and is from 12 to 30 ft. in width. Under such conditions, the small output has been obtained without getting below stream level, or no more than 50 to 60 ft. below the outcrops on high ground. The production seems entirely out of proportion to the magni-

Southern Talc Co.'s Mill

tude of the deposits, which, with development should turn out hundreds of tons daily if conditions remain the same with depth. There is no reason to suppose that this mineral will be confined to any shallower regions than the metallic minerals which, in this country, are found at 800 ft., the maximum depth of exploration. There are three companies operating here and it seems that the present limited production is probably due to difficulties in marketing.

A Steam-Driven Grinding Mill

The property of the Southern Talc Co. is situated on the southwestern end of the developed territory and is near Deep River. A 75-ft. shaft was sunk here and some drifting and crosscutting done tributary to it. In one of the crosscuts a belt of pyritic schist was cut, so heavy in sulphide that it suggests the possibility of commercial deposits of this mineral. Over a year ago high water from Deep River flooded and caved the underground works to some extent, and since then the product has been taken out of opencuts or purchased from outside sources.

The mill is steam driven and has a capacity of 10 tons of fine "talc" (as it is called in the trade after grinding) per 10-hr. shift. It is well adapted to handling the material it grinds, which contains some quartz. This is separated in the milling process as a finely comminuted powder and is incorporated into a scouring soap at the Boston factory owned by this company for working up the products of the plant.

The stone is delivered on the ground floor of the mill and fed to a Sturtevant crusher. From this it is elevated to a storage bin feeding a vertical emery and buhrstone mill that grinds the product to the fineness of flour. It is then raised to a separator, which in appearance is an octagonal tank with a funnel bottom. The fine material drops on the apex of a funnel-shaped spreader within the separator, and the coarser particles fall to the bottom and are returned to the mill to be reground. The suction of a fan, connected to the separator, draws out the lighter particles and passes them to a second or auxiliary separator, where the material discharged at the bottom is ready for shipment or, if required, can be ground finer. A lighter suction is applied to the second separator and the finer particles are withdrawn and carried to a collector which is made much larger on account

Glendon Mill on Deep River

of the particles having become exceedingly small and requiring more space to come to rest.

The discharge from the hopper bottom of this collector is the regular product of the plant, and is bagged for shipment. The extremely fine powder passes out at the top of the collector and into a circular pipe from which hang tubes of porous cloth. These tubes catch the finest product made in the mill. The tailing from the second separator is reground in a pebble mill, which is a small tube mill lined with porcelain plates.

Talc Mined in Opencut

One-half mile northeast is the property of the Deep River Talc Co. This property consists of a long opencut provided with a track and cars that deliver the crude rock at the top of the storage sheds. Another line of track extends from the lower floor to the highest part of the mill. The plant is well built and is above the average seen at mines in this part of the country. Sturtevant grinding machinery is used and the sizing and separating is accomplished by a pneumatic process devised by J. J. Stockton, the local manager.

Glendon Mill Driven by Water Power

Adjoining the Deep River Talc Co. is the mine of the Glendon Mining & Manufacturing Co., which has been opened for a considerably greater distance along the strike of the deposit than any of the others. A long open crosscut furnishes the means of haulage from the open pits that have been excavated in the search for the talcoid mineral. Ordinary opencut methods are followed, deep holes are churned down with little effort, as the ground is soft, and hundreds of tons are broken and delivered to the loading bins at minimum cost. The rock is hauled in wagons two miles over a bad road to the mill on Deep River. Some attempt is made at sorting as well as selecting the better portions of the mineral in mining it. The merchantable material occurs in a somewhat erratic way and a heading that is today in first-class rock, may tomorrow have to go to the waste dump on account of small particles of hematite or grit. The crude stone is fed to a crusher at the top of the mill, and then goes to buhrstones and bolters, quite like those used in the earlier types of flour mills. The motive power at the mill is hydraulic, furnished by a wooden dam 250 ft. long and 15 ft. high.

The tailing from the bolters is reground in a revolving pebble mill. The larger and more massive mineral is cut into crayons and pencils by saws with which the mill is provided. It is the only one in the district so equipped. All of the milled product is shipped via the Raleigh, Charlotte & Southern Ry., through Glendon, and is hauled in wagons over a road that is inimical to profitable results with a material whose net value is as low as this. It is not easy to ascertain just what the ground pyrophyllite is worth, but it is probably between $6 and $8 per ton at Glendon.

Golston Property Will Be Developed by Shafts

Near the station of McConnell, on the Randolph & Cumberland R.R., a few miles south of the producing territory, the Golston Mining Co. owns a large undeveloped deposit. It is its intention to explore by sinking shafts and if commercial mineral is found, a mill will be built on the railroad and the neighboring power site on Deep River will be developed to supply motive power. At present the bulk of the shipments is north, to the soap factories, toilet-power manufacturers, bleacheries, rubber works, makers of pipe covering, and for paper sizing. With the industrial development that is going on in North Carolina, there should, in a few years, be a good local demand for the products of these mines which will result in an industry whose commercial importance approaches that of the Gouverneur talc region in New York. The great amount of waste material that cannot be used on account of grit and particles of hematite, is one drawback to the local industry. It has been suggested that this be used for making firebrick, but although experiments have been carried on to that end, there is as yet no visible practical result.

❖

A Patent on a Classifier has been secured by James W. Shields, superintendent of the Quincy stamp mills. The machine has been in operation, in an experimental way, in the Quincy stamp mill for over a year, with exceptionally good results on Pewabic lode rock. It is compact, does the work of jigs, classifiers and tables with less power and less water and gets better results.

Rhodesian Mining Notes

The prospects of the mining industry in Rhodesia are unfortunately not bright, despite the fact that several large mines will shortly become producers. The reason is to be found in the almost entire absence of new discoveries and the gradual exhaustion of the small mining ventures started on ancient workings or partly developed mines. Most of the country is easy to prospect and the ancients discovered almost all the payable orebodies. Several of the oldest and most reliable producers of the past have been exhausted or are showing signs of weakness. The Eldorado mine, which has been a consistent producer of 12- to 15-dwt. ore, for a 20-stamp mill, drawn from two shoots each 500 ft. long, and which has been paying £90,000 per year in dividends, is apparently rapidly approaching its end. One orebody has become unpayable and the other is rapidly contracting in length at the 10th level, being now only about 120 ft. long.

The Giant mine, which has been paying £100,000 per year in dividends, is also doomed, unless some unexpected discovery is made, as its large orebody terminates at the 7th level. The once famed Jumbo, Selewke, Bucks Reef, Beatrice and other mines are exhausted and in some districts the small worker has almost ceased to exist. The new producers will undoubtedly be able to raise the output for some years. On the Planet-Arcturus group, near Salisbury, 206,806 tons of refractory ores, valued at about 15 dwt., are developed. The Bell Reef mine has recently struck the reef at the seventh level, assaying 47.3 dwt. over a width of 33 in. and should have over 60,000 tons of ore available. The Shamva mine is developing well on the fourth level, the orebody having widened out.

The railway is now finished to the mine. As showing the burden of rail freight, it is estimated that the rail transportation alone on the plants ordered for the Shamva, Planet-Arcturus and Golden Koppie mines will total £250,000. Much of the ore from the Shamva mine can be quarried, as the orebody occurs in a hill 800 ft. high, and reaches a width of 200 ft. It is proposed to draw the ore from the adits, by means of petrol locomotives, to a large storage bin. A self-acting incline will deliver the ore to the mill grizzlies and the coarse ore will be broken by three No. 7½ Gates breakers. The reduced ore and fines are delivered on a belt to trommels which deliver ¼-in. material to the tube mills, while the oversize will go to the ore bins of fifty-six 2000-lb. Nissen stamps, crushing to ¼ in., the ore being crushed in cyanide solution. The pulp passes through feed cones to eight 22-ft. tube mills, using Osborne liners, to copper plates and over blanket tables and to a centrifugal pump to be elevated back to the cones. The overflow from the cones goes to another set of eight cones, four set over four others, for collecting the sand. The latter will be mixed with barren solution from the tails of the extraction boxes and will gravitate to eight 50x8½-ft. sand-collecting and leaching tanks for treatment and disposal to the dump by rope haulage. Slime and solution from the overflow of the sand cones will flow to five 38x10-ft. Dorr thickening tanks, part of the clear solution overflow of which will pass to extraction boxes and the balance to the mill supply tanks. The thickened pulp will be pumped to five 45x10-ft. Pachuca tanks, connected in series for air agitation, and subsequently transferred to the storage agitators of a Butters filter plant of 336 leaves. Zinc extrac-

tion boxes will be used. The water supply will be pumped eight miles through 12-in. pipe and the power plant will consist of six Babcock and Wilcox marine-type water-tube boilers, capable of evaporating 90,000 lb. water per hr. There will be three 1250-kw. Parsons turbo-generators to supply current to run the plant and water-supply pump. Steam will also be supplied for a 5000-cu.ft. Pokorny & Wittekind turbo-compressor. The plant is expected to treat 50,000 tons per month and cost of treatment is expected to be 4s. 6d. per ton, coal and water being expensive items.

The ore reserves now amount to 2,320,000 tons of a recovery value of between 20 and 23s. In No. 4, the lowest level, the orebody is 80 ft. wide, assaying 5½ dwt. Last year the Lonely mine treated 37,655 tons of mine ore and 6331 tons of accumulated slime for a total yield of £160,180. Costs averaged about 33s. per ton. The ore reserves are 174,224 tons of an estimated value of 22.4 dwt. per ton. The 15-stamp mill with three tube mills is to be increased by five stamps and one tube mill. The Cam & Motor mine, for the half year ending 1912, developed 111,832 tons of ore, valued at 39s. 5d. per ton. The ore reserves are estimated at 1,016,240 tons, valued at 44s. 6d. per ton. Working costs, including treatment by roasting by West Australian methods, are estimated at 23s. per ton. The mill will treat about 200,000 tons per year.

All Rhodesian shares have recently fallen heavily on a report that the assays in gold and copper of the Falcon mine were incorrect and the sampling had been bad. It was later stated that these had been officially checked with favorable results. I have stated in these columns that the mine was over-valued, as the cost of reducing the copper-gold ore would be excessive, and recovery would be low.

In the far north in the Congo Free State, progress is being made in the Katanga copper mines. An enormous amount of capital has been sunk in developing these deposits. The railway from Lobito Bay, on the west coast, has alone cost £4,400,000, and has covered only 520 km. out of the 1000 to be constructed. It has, however, overcome its worst difficulties in reaching the high central plateau. At the recent meeting the chairman stated that 1000 tons of coke were being received every month from Wankies colliery, in southern Rhodesia and that by the end of the year, 44 ovens would be working on the mine, producing 3000 tons of coke per month. By washing the ore, 80% became available for smelting on more economical lines. Previously it took 3.44 tons of coke to produce one ton copper from 12% ore; now, it takes 2.65 tons of coke to produce one ton copper from 15% ore. The first blast furnace has produced 5000 tons copper. Two furnaces are now working and producing about 1000 tons copper per month at a cost of £42, delivered in Europe. This cost will be reduced by £7 when Benguela-Lobito Bay railway is finished. At the Star of the Congo, about half the area is developed to 80 ft. in depth and it can keep two furnaces going four years. Shafts and bores to a depth of 100 ft. below this "indicate the existence of valuable ore," but again the chairman is silent as to whether it is oxide or sulphide ore.

The railway is nearly finished to the Kambove mine, which is estimated to produce double what the Star can and two other mines on the line, Loshia and Sikasye, are estimated to be of equal value to the Star. The erection of four additional furnaces will be started in July and when these are finished an output of 30,000 to 40,000 tons of copper per year is confidently expected. Coke at present costs £5 per ton.

It would seem that in another 18 months or two years all the initial difficulties and mistakes of this vast enterprise will have been overcome and a new and serious competition in copper production must be reckoned with. Unfortunately for the shareholders, the capital expenditure and the cost of raising further capital have been so great that dividends are still far distant. However, the railway to Lobito Bay is paying its way and is, apart from the mines, a vast asset in opening up large areas to trade and settlement. There are also large tin deposits lying in the sleeping-sickness areas that will later, no doubt, prove an asset, and there are diamond interests on the Kundelunga tableland. It is said that 120 small diamonds have been discovered in the pipes, 29 of which weighed only five carats. Four white men and 80 natives are at work. A total of 12 pipes have been found. Machinery from Kimberley is being imported to test the pipes on a large scale.

Gold in the Shinarump Clays

The Shinarump is a Triassic formation occurring in Utah. It contains certain beds of unusual clay. A description of the formation near Paria, where the Paria River cuts it, in the southern part of the state, is given by Andrew C. Lawson, in *Economic Geology,* August, 1913. The clay beds are soft and highly colored, and act most peculiarly in water. Although themselves containing considerable amounts of water, which may be driven off at 105° C., the addition of more water causes the clay promptly to disintegrate and to flow. A fragment immersed in water swells enormously and breaks down rapidly into an incoherent flat cone. Examined microscopically, this material appears to be composed almost wholly of a colloidal substance, with a small admixture of fine silt and concretions of lime carbonate and iron oxide. Swelling and slacking is probably due to the colloidal absorption of water. The mixture is so fine as to pass freely through filter paper. Its peculiar behavior is in marked contrast to other sedimentary clays. Chemical analysis shows an excess of silica over that necessary to account for pure clay, and since there is not sufficient quartz to furnish this excess, it is concluded that a large portion of the colloid is really silicic acid.

The clays are auriferous, and the beds have been staked with placer claims. Mr. Lawson sampled some of the exposures with considerable care, taking 25- to 30-lb. samples every 10 ft., measured vertically, in three trenches cut down across the formation. The average assay of all the samples he puts at 2½c. per ton, equivalent to 5c. per cu.yd. Similar results were obtained by an amalgamation test on large samples, using chemically pure mercury. The value is comparable with that of other low-grade deposits, and various attempts have been made to exploit the clays for gold. The possibility of commercial extraction is problematical, and only after a long period of experimentation could a project possibly be successful. Water must be cheap and overburden practically absent. Reckoning 5c. per cu.yd. of gold content, the total content of the clay would be $1,500,000,000,000.

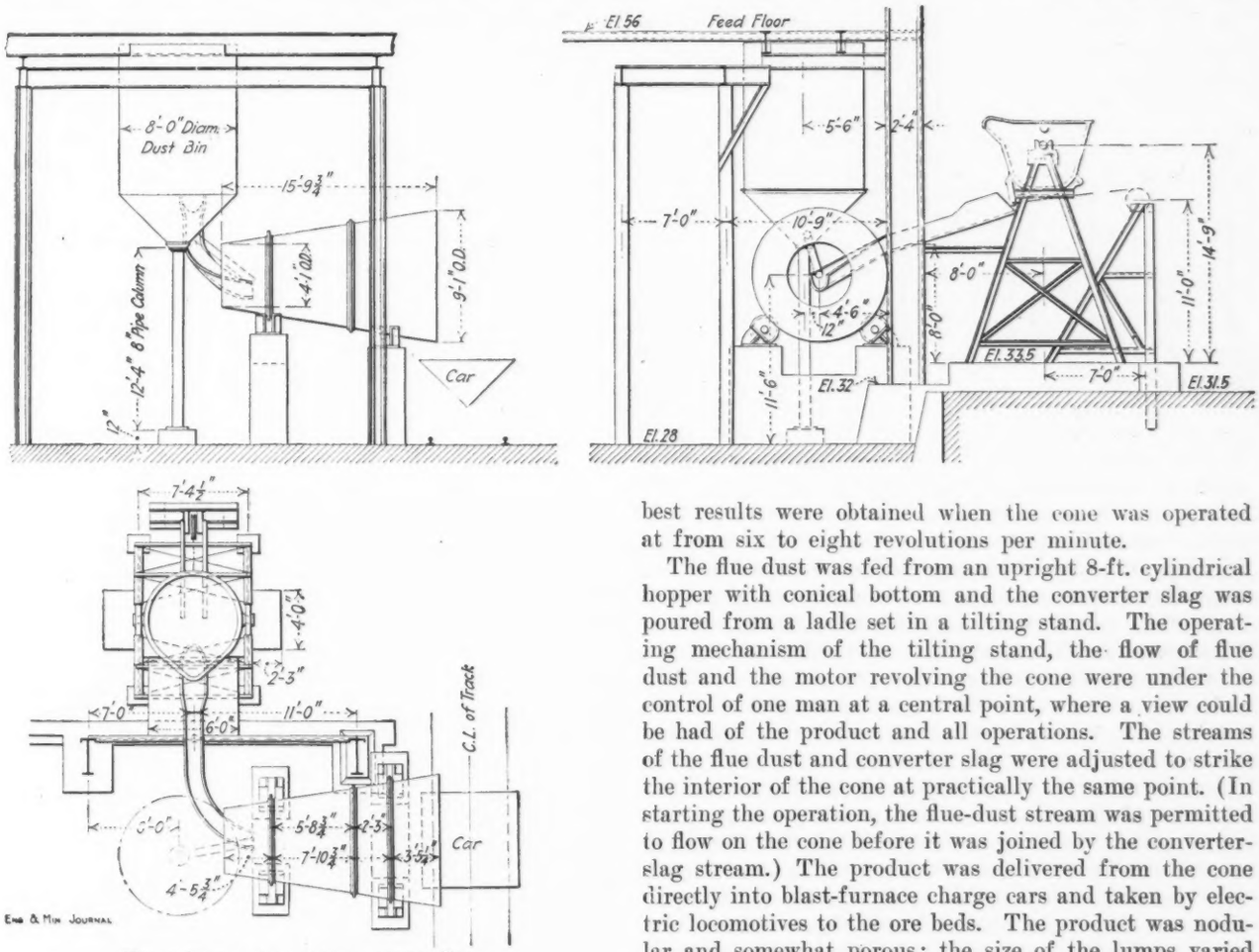
The Douglas Agglomerating Cone

At the Copper Queen smelting works at Douglas, Ariz., flue dust and converter slag were agglomerated for a number of months in a hollow revolving cone, following experiments initiated in June, 1909, first with a cylinder and afterward with the cone, by Forest Rutherford, then assistant superintendent.

Owing to an increased amount of sulphide ore from its Bisbee mines, the Copper Queen company found it advisable to cease charging Moctezuma concentrates into the blast furnaces and installed McDougal roasters and reverberatory furnaces for treating this Nacozari product. With the establishment of this equipment, the reverberatory furnaces formed the natural outlet for flue dust and work with the agglomerating cone was discontinued. While the experiments with the cone were not carried to the final conclusions desired by Superintendent Rutherford, yet a good product suitable for blast-furnace use was made practically continuously for over four months, when the last run was made, and enough work done to demonstrate the availability of the cone for agglomerating. The equipment should be of interest to those smelting plants that do not make sufficient dust to warrant the expensive reverberatory installation.

Since the building of the Copper Queen reverberatory furnaces, the agglomerating cone at the Douglas works has been dismantled, and lest the arrangement of this equipment pass out of metallurgical history unrecorded, we present herewith a reproduction of the drawing, showing the arrangement of the equipment as originally installed at the Copper Queen works.

The work at Douglas was done in a cone or, strictly speaking, in the frustum of a cone having a length of 15 ft., a diameter of nine feet at the large end and a small diameter of four feet. The cone was made of ½-in. steel plate with cast-iron liners 1½ in. thick. The cone rested on two riding rings 7 ft. 10¾ in. apart, and between these was the rack by which it was revolved, a 50-hp. motor having been used for this purpose. The best results were obtained when the cone was operated at from six to eight revolutions per minute.



FLUE-DUST AGGLOMERATING CONE

The flue dust was fed from an upright 8-ft. cylindrical hopper with conical bottom and the converter slag was poured from a ladle set in a tilting stand. The operating mechanism of the tilting stand, the flow of flue dust and the motor revolving the cone were under the control of one man at a central point, where a view could be had of the product and all operations. The streams of the flue dust and converter slag were adjusted to strike the interior of the cone at practically the same point. (In starting the operation, the flue-dust stream was permitted to flow on the cone before it was joined by the converter-slag stream.) The product was delivered from the cone directly into blast-furnace charge cars and taken by electric locomotives to the ore beds. The product was nodular and somewhat porous; the size of the lumps varied from ½ to 5 in. in diameter.

At times the flue dust fed amounted to 35% of the weight of the converter slag, but results with this amount were not satisfactory, and the practical operating limit was considered to be 25% of flue dust, the heat product being made with between 15 and 20% of flue dust. Normally from 60 to 75 tons of flue dust were agglomerated with 350 to 400 tons of converter slag in twenty-four hours.

That the general idea of agglomerating fine material with converter slag in the hollow cone is likely to find further application is evidenced by the decision to install agglomerating equipment at the Arizona Copper Co.'s new smelting works at Clifton, where two cones will be erected for the purpose of agglomerating or coating siliceous-ore fines with converter slag, with the idea of obtaining greater fluxing efficiency from the converter slag

when this product is charged into reverberatory furnaces.

Although the idea of using a truncated cone for this purpose was worked out at the plant of the Copper Queen Consolidated Co., the general idea of mixing fine material with slag or matte in a rotating machine or cylinder was, as far as we know, first tried in Cerro de Pasco, by W. M. Barker, but the difficulty of removing the crusts formed was so great that the experiments failed. The cone shape of the drum overcame this trouble and made the process a success.

The primary object of the experiments was to work up the flue dust and reduce metal losses, but the outcome was the development of a satisfactory slag-casting machine, using a small amount of fine material to facilitate the operation.

❖

Notes from the Mid-Continental Oil Field

By Erasmus Haworth*

The price of oil has advanced continuously throughout the year. The Prairie Oil & Gas Co. (the Standard) now pays $1.03 for all qualities and is prompt in extending pipe lines into new fields. Independent companies generally pay more, sometimes as much as 10c. in advance of the Standard, but generally about 5c. These prices contrast so strongly with the 42c. per bbl. which was the Standard's price for two or more years previously, that drilling operations are almost as active now as they ever have been in the history of the Mid-Continental field. It is excessively dry this summer and water for drilling is scarce and many drills are in forced idleness. Gas, also, is selling for more than ever before and the prospective demand is great, so operators are pleased to obtain either oil or gas.

The Kansas Natural Gas Co. is so badly tied up in litigation just now that no one knows what arrangements can be made for a winter's supply for Kansas City and other northern points. It is generally believed that the courts will have the legal difficulties adjusted so that the Kansas Natural will be enabled to do its best to serve its customers by the time winter sets in.

Kansas

Recent drilling has considerably increased the production of both oil and gas, principally by enlarging the old fields abandoned years ago when prices were so low that production was unprofitable. The new production is noticeable in almost every field, Wayside, Coffeyville, Neodesha, Cherryvale, and at different places in Chautauqua County. No remarkable discoveries have been made, but many paying ones. Clauss, Brown & Wolfe Co. has opened up a new gas pool a few miles northeast of Coffeyville, where at from 500 to 700 ft., they find wells ranging from 1,000,000 to 6,000,000 cu.ft. per day. They have a pipe line into Coffeyville and are selling gas at 10c. per M. cu.ft. to substantially all the factories there.

Oklahoma

Many new discoveries of both oil and gas are reported from Oklahoma. Good gas is found near Wann, in supposedly dry territory, and occasional wells are found around the borders of old fields. Stubbs & Law brought in a monster well 5 miles northeast of Dewey, reported variously at from 20,000,000 to 46,000,000 capacity. It failed rapidly with use, however, and it is now reported to be almost gone, although but a few months old. Unusually strong oil wells have been developed in the Cushing field, southwest of Cleveland. The Waters-Pierce Oil Company is reported to have paid $480,000 for a single 80-acre piece, the east half of southeast fourth of section 8-17-7. It was then at high tide of production, it is said, and is now slowly declining. Strong gas wells are found around the borders of this oil pool especially to the east, very like the strong gas to the east of the Glen pool, previously developed.

Excitement is now strong over a new discovery at Lost City, just south of the Arkansas River, five miles west of Tulsa. The Gladys-Belle Oil Co. drilled a few good wells and sold 40 acres for $75,000 to the Gypsy Oil Co., which is the producing end of the Gulf Pipe Line Co. Charles Page has brought in a number of wells here, one of which flowed natural 90 bbl. per hr. for some time, and still is one of the biggest wells ever found in Oklahoma. Good development also is made around Okmulgee, both north and south, wells ranging from 50 to 500 bbl. production. It now looks as if the total production for the year would equal that of last year, and possibly surpass it.

*State geologist, Lawrence, Kansas.

❖

Metal Trade of China

Notwithstanding the political disturbances of the past year in China the foreign trade seems to have kept up fairly well. The exports and imports of minerals and metals are given by the customs returns for two years past as follows, in long tons:

	Exports		Imports	
	1911	1912	1911	1912
Coal	19,441	40,507	.....	.....
Iron ore	109,807	201,552	.....	.....
Iron and steel	68,639	7,978	151,320	96,778
Copper	.....	.....	5,533	8,204
Tin	5,960	8,645	1,955	2,389
Tin plates	.....	.....	21,334	20,690
Lead	553	.....	7,725	5,731
Lead ore	5,325	4,218	.....	.....
Zinc	699	748	828	1,191
Zinc ore	4,648	7,085	.....	.....
Antimony	6,817	13,313	.....	.....
Antimony ore	6,704	2,022	.....	.....
Nickel	.....	.....	32	49
Quicksilver	18	4	51	48

There were many sharp changes last year, chiefly due to political troubles. Iron and steel exports fell off on account of the temporary stoppage of the Hanyang iron works. On the other hand, there was a good increase in antimony, though exports of ore decreased.

Imports of mineral oils in 1911 were reported at 235,898,240 gal.; in 1912 they were 197,902,362 gal., a decrease of 37,995,878 gal., or 16.1%. Of the total last year 123,441,777 gal. came from the United States.

❖

The New Mines Act of the Province of Alberta, which went into effect Aug. 1, prohibits the employment of women and girls in or about mines. The age limit for boys working underground is raised to 16 years. Boys over 14 may be employed on the surface providing they have attained a certain educational standing. With a view to greater safety in mines the mimimum age of managers and pit bosses is raised to 25 years, and that of foremen to 23 years. Provision is made for the appointment of a provincial board of examiners, which may replace the district boards at present in authority. An important change in the law regarding the inspection of mines, enables the workmen to appoint an outside representative for this purpose instead of one of their own number, so that he will be able to present an unfavorable report without fear of dismissal. Pay days will be twice a month instead of every 30 days as formerly.

Ores Amenable to Cyanidation

By Herbert A. Megraw

SYNOPSIS—A discussion of the various ores upon which cyanidation has been tried. Success first achieved upon clean siliceous ores carrying free gold. The applications of the process have been carried to almost all kinds of ores, some manganese compounds carrying silver being about the only ones which have altogether resisted treatment. The most promising field for extension of the process is in those ores containing readily soluble base metals, which may possibly be precipitated and made to return their combined cyanide for further use.

Alkaline cyanides as commercial solvents for precious metals are said to have been offered to Western metallurgists in 1890, their first employment in the United States. Previously, they had been used on the Witwatersrand gold fields where their first practical application was made. In America, the process was received with suspicion and was strongly opposed by many prominent metallurgists. Its disadvantages were made much of and its possibilities for economy were not generally appreciated.

Clean Gold Ores the First Cyanided

Although early experimenters asserted that both silver and gold ores could be beneficiated by cyanide, some even maintaining that gold ores containing no silver were not easily treated by the cyanide solution, the first applications were to free-gold ores, and it was in that field that its first success was attained. The simple reaction illustrating the solution of finely divided particles of gold in cyanide solutions is too well known to require repetition. It is upon this reaction, however, that the first practical applications of cyanidation were based. Purely siliceous ores, void of sulphides or base metals were originally considered about the only ones suitable for cyanidation, and were actually the ones upon which success was really established. Early attempts at application to refractory ores were accompanied by some discouraging failures resulting, in many instances, in a permanent prejudice against the process. In spite of its subsequent improvement and the expansion of its field of usefulness, the cyanide process has never been allowed to enter into these places and consequently many of them have overlooked economies which might profitably have been used. A notable example of such cases is found on the Motherlode mines of California. Here the process was early tried and failed for reasons which, though obscure at that time, are now thoroughly understood. Up to the present time, however, Motherlode operators have been exceedingly prejudiced against cyanide and cannot be convinced that it could, by any chance, be of benefit to them. The successful application of the process to similar ores in California may be influential in correcting this bad impression and in securing, at least, another trial.

Note—This is the second of a new series of articles by Mr. Megraw, the first of which appeared in the issue of Sept. 6, 1913, and which will deal with the comparative details of cyanide practice. The next article will treat of "Grinding Ores for Cyanidation," and will appear in the issue of Nov. 1, 1913.

Not All Ores May Be Economically Cyanided

Speaking in the broadest sense, all ores are amenable to cyanidation, that is, the precious metals in any ore may be dissolved in cyanide solutions, and recovered if the proper procedure is followed. The necessary manipulations may be simple or complex, and complexity may reach such a point that there may be no profit in the operation. This brings us up into view of the deciding factor in cyanidation, which, as in all other industrial endeavor, is the factor of commercial profit.

There are only a few ores which may not be treated by cyanidation in some form, but many which cannot be economically beneficiated by that method. Metal in a pure state, occurring in large particles, is not economically dissolved by cyanide solutions, not because the metal is not soluble, but on account of the great length of time necessary for that dissolution. Very small particles of either gold or silver may be dissolved by cyanide solution of the requisite strength in extremely short spaces of time, depending entirely upon the degree of fineness of the metal. Relatively coarse particles require abnormally long periods of time for dissolution, so that ores containing mineral of this kind cannot be considered as amenable to economical cyanidation.

Physical Characteristics of an Ore Influence Its Treatment

It must not be forgotten that the suitability of an ore for cyanide treatment does not depend altogether upon its chemical character, but also in large part, upon its physical properties. It is easy to see that some chemical combinations will be difficult to cyanide, but it has not always been recognized that the physical characteristics also have a great influence upon ore treatment. They may not go so far as to exclude it altogether from the possibility of successful cyanidation, but may certainly make necessary a different kind of plant from that required for ores more easily handled. It used to be considered that an ore which made a great quantity of slime was an embarrassing one to cyanide, but at present it may be said that such an ore presents facilities which make its treatment simple and cheap. At this stage of the metallurgy of gold and silver by cyanide, the greatest physical difficulties are presented by ores which cannot be readily reduced to extreme fineness, and in which that extreme fineness is necessary to liberate the contained gold and silver, so that cyanide solutions may have maximum opportunity to act. It is easy to see that the additional grinding required to subdivide finally an ore of this kind would cost a great deal more, and even require a plant of different character from that required by an ore which could be easily and cheaply ground to an extremely fine state.

It is by no means impossible that an ore should require practically no grinding at all to enable it to be successfully cyanided. Examples are on record of ores which have merely been put through a breaker, principally for the reason of making a product which would be rather simple to handle mechanically, dumping this product into a cyanide tank and subjecting it to a leach-

ing process. The explanation of this situation is that the ore was an oxidized one and was largely porous, and that the gold, which was its principal valuable constituent, could be reached by the solution without difficulty. A comparatively high extraction might result in such cases. One example of a somewhat similar case in operation at the present time is that of the Wasp No. 2 mill in the Black Hills of South Dakota, where the ore is only passed through breakers and rolls as a preliminary preparation for cyanidation. The rock is reduced to ¼ in. in size, delivered on belt conveyors to leaching tanks, and subjected to leaching for a protracted period. The explanation in this case is that the gold is almost entirely in the cleavage planes, and the breaking and roll-crushing undergone opens these cleavage planes, which are naturally the weakest points in the rock. By this coarse breaking most of the contained gold is exposed to the action of cyanide solution.

Ores which contain large proportions of clay or colloid material used to be considered objectionable because they interfered with easy leaching. Where it was necessary to grind ores down to pass a 30-mesh screen, or even a great deal finer, it was found extremely unsatisfactory to try to leach both sand and slime together. The clay, or colloid material formed impermeable, or difficultly permeable beds, which retarded or stopped altogether flow of solution through the tank. Great relief was felt when it became known that sand and slime could be separated. At first the sand portion only was treated and the slime either thrown away or impounded in dams for future treatment, should a process become available. Such a process has not only become possible, but sometimes is easier and cheaper to manage than leaching, so that now not only is the slime treated, but effort is made to get the whole of the material in the form of slime and treat it by agitation. Here the tendency has been to go to the other extreme, and many ores are being agitated which are really not sufficiently ground to justify that treatment. It takes a large amount of power and results in great wear on machinery and plant to try to agitate sand which is even comparatively coarse, and it is probable that if th situation were regarded philosophically, an effort would be made to separate sand, no matter how fine it is, and leach it. There is certainly no great difficulty about leaching a clean, granular sand, irrespective of the size of the separate particles.

An additional physical difficulty with some ores is the reluctance with which the slime, or finely divided colloid material, settles when in solution. This difficulty may be so marked as to require specially expensive treatment, different plant design, and even a different treatment system. During the days when the decantation system of slime treatment was in vogue, this objection to settling was a most serious difficulty. At the present time, however, when slime filters, together with continuous agitation, are so much in use, it is not necessary that the slime be easily settling, as it is not required to settle it all. It is agitated continuously throughout the extraction treatment, and when that is finished, it is passed through the filter which dewaters it successfully, without the difficulty of settling.

Chemical Nature of Ore of Greatest Influence

The chemical nature of an ore is usually referred to when statements are made as to its suitability for treatment by the cyanide process. Interference, such as this, results from elements which occur in the complex ores, and which obstruct successful cyanidation either by destroying the cyanide solution, consuming all its available oxygen, or excessively consuming the cyanide itself by its dissolving the baser elements themselves to an excessive extent. An element like copper, for instance, which really has no detrimental effect upon cyanide solutions, is just as prejudicial to successful cyanidation as an element which might act in an entirely different way, because if it is in suitable form, it is entirely soluble itself and will use up excessive quantities of cyanide, producing no equivalent return. Purely copper ores are, of course, not treatable by cyanidation, because the amount of cyanide necessary to dissolve the metal is worth more than the metal recovered. Statements of this sort, of course, are subject to reservation, as methods may be discovered, and are entirely possible, whereby copper or any other element dissolved in excess by cyanide solution, may be recovered with a return of the entire amount of cyanide required to dissolve the metal, in which case these elements could no longer be considered as interfering with straight cyanide practice. The recent development of aluminum as a precipitant points to the entire probability of such methods coming into practice in the near future. At present they have not received a great deal of study, so far as the general public is aware of, but it is easy to see that if the cyanide used up in dissolving, can be returned to the solution with the extraction of the copper itself from the solution, there is nothing to prevent ores containing large quantities of copper being readily treated by the cyanide process. Other methods have been suggested for doing the same thing, among which may be mentioned the ammonia-cyanide process, which really presents probabilities for successful results.

Iron Not Generally Harmful in Cyanidation

Metallic iron was formerly considered a great objection to cyaniding, as it was believed that it robbed the solution of oxygen, thus materially reducing the soluble effect of the solution on the gold. Now, however, it is well recognized that iron pipe, tanks, valves and other fittings have no effect whatever upon the cyanide solution. It is undoubtedly true, nevertheless, that finely divided iron, such as filings, abrasions from stamps, pan dies, and other grinding machines, does have a reducing effect upon the solution. Some iron ores are readily acted upon by cyanide solutions, and are injurious to treatment. The yellow oxide of iron, limonite, is not so much acted upon by solutions, but has a strong tendency toward making slime, and is somewhat objectionable for that reason. This slime is particularly pasty and is hard both to settle successfully and to filter.

Pyrite, the well known iron sulphide, and the one most generally found in both gold and silver ores, is acted upon by cyanide slowly, although it is not easily decomposed. White-iron pyrite, or marcasite, is not as soluble as pyrite, but decomposes more readily. The decomposition products of sulphides of iron are the products which are most harmful. Among these may be mentioned ferrous sulphate and oxide, and sulphuric acid, all of which consume cyanide. In this case iron enters solution as potassium ferrocyanide, and the alkaline cyanide is neutralized by the acid.

Sulphur Forms Well Known Objectionable Compounds

As is well known, alkaline sulphides are found in solutions where any appreciable amount of sulphur is contained in the ore. Sulphur acts to form alkaline sulphides, and does not directly influence the cyanide. The alkaline sulphides react with cyanide and oxygen and form sulphocyanides, or thiocyanates, or they may unite with oxygen to form sulphates, the result being abstraction of oxygen from the solution. Probably the most important and detrimental action of alkaline sulphide is to precipitate silver from cyanide solutions in which it is dissolved. The silver is precipitated as silver sulphide, and thus a cycle of operations is set up which prevents the successful recovery of the silver. When thus precipitated from cyanide solutions, silver is extremely difficult to redissolve, and in some cases it may be said to be impossible. There are remedies for the ill effects of sulphur, of course, the most popular of which is the use of lead salts, acetate or oxide, which unite with the alkaline sulphide and form insoluble lead sulphide which is precipitated, thus removing the sulphur from solution.

Copper Dissolves Too Readily in Cyanide Solution

Copper has already been mentioned as one of the elements which are objectionable in cyanide treatment of ores. The objection, as has already been mentioned, is not that the element has any particularly detrimental action upon cyanide, but is due to the extreme solubility of the metal itself in cyanide solution. Copper in many forms, such as sulphides, silicates and other well known copper minerals, is not readily soluble, and these minerals do not cause any great difficulty in cyanide treatment. When, however, one encounters soluble copper, such carbonates, oxides, hydrates, etc., they seriously disturb treatment by dissolving readily and using up too much cyanide to allow economical results.

Not only is the cyanide itself used in excess, but the action upon precipitation is also prejudicial. When precipitation is upon zinc shavings, copper covers and fills the shavings and prevents further precipitation of either gold or silver, thus causing a huge waste of zinc. This difficulty may be partly obviated by using a smaller quantity of zinc for precipitation, thoroughly covering it with lead acetate, or with a lead precipitate, before precipitating the copper-bearing solution, and by shaking the zinc so as to dislodge the copper already precipitated, every day. This process must be attended to with great regularity, otherwise the copper will form a hard, compact coating upon the zinc, and render it useless for further precipitation. If it were possible to precipitate the dissolved copper and return to the solution all the cyanogen used in dissolving the copper, these great objections to its presence in ores would not be found.

Mercury Is Destructive of Zinc

Another element which presents serious difficulties in cyanidation is mercury. It has generally been stated that when this element occurs in a native state, it is not easily dissolved by cyanide, but this statement will have to be modified somewhat. It may be true that pure mercury is not readily soluble in pure cyanide solutions, but in working cyanide solutions which, as is well known, contain many other chemicals beside cyanide, even metallic mercury is rather readily dissolved. In old tailing where mercury exists as chloride, oxide, etc., it is dissolved quickly, even more quickly than gold or silver, and introduces complications. Its effect upon zinc is even worse than that of copper. It makes zinc shavings brittle, decomposes them until they fall to pieces, and induces an enormous waste of zinc. A little mercury in cyanide solution is beneficial to silver and gold extraction, as it precipitates the soluble sulphides in the same way that lead salts do, throwing down the insoluble sulphide of mercury. A great amount of mercury, however, has no particular advantage and has great disadvantages. It may be said with truth that both mercury and copper are much less objectionable in plants where zinc-dust precipitation is used, because these elements are removed from solution immediately by being precipitated on the extremely fine particles of zinc as they occur in the dust. The waste of zinc is not apparently large, and is considerably less than when shavings are used. It is altogether probable that the same conditions would obtain, were aluminum dust used for precipitation in place of the zinc. There are, however, no definite facts which are well enough known to be stated as such. Many gold or silver ores do contain small amounts of mercury, either in the native form or as oxides in cinnabar ores. A notable example of the occurrence of mercury-silver amalgam is in the rich silver ores of the Cobalt district, of Ontario, Canada.

Lead and Zinc in Ores May Prevent Dissolution of Precious Metals

Lead and zinc are objectionable, to some extent, to cyanidation processes. Lead sulphide, galena, is very slightly attacked by cyanide and presents no particular obstacles to cyanidation except through the contained sulphur. Should the galena contain silver or gold, the combination is, of course, prejudicial to good extraction, as it is not attacked by cyanide solution. Lead in the pure state, especially when finely divided, is rather readily dissolved by cyanide, and also when in the form of carbonate or oxide, but to a somewhat less extent. Zinc acts very much as lead does in cyanide solution, the sulphide being only slightly attacked and the pure metal dissolved by cyanide solutions, in this case, much more readily than in the case of lead. As is the case with lead-sulphide ores, zinc sulphides are not prohibitive of successful cyanidation except where the silver value is held by the sulphide combination, in which case, of course, there is small chance for the cyanide to dissolve it.

Zinc-lead combination ores, in which the mineral occurs as sulphide or, in fact, in almost any other chemical combination, present one of the complexities which has so far resisted successful cyanidation. There are in existence a great number of mines containing lead-zinc sulphide ores, which carry small amounts of silver, which, if each of these metals could be recovered separately, would be of considerable value. Of course, in cases where the amount of silver is large, or where either lead or zinc is largely predominant, these ores can be concentrated and the product smelted with success. When all the metals are low in quantity, it is not a profitable operation, however, as it is difficult, if not impossible, to recover lead and zinc separately from such ores by smelting methods. It should not be at all impossible to make such ores amenable to a modified cyanide process by some preparatory treatment which would make the lead and

zinc soluble in cyanide solutions, and then to devise some process by which exorbitant amounts of cyanide should not be lost. That such processes are, at least theoretically, not impossible is evidenced by the ammonia-cyanide treatment, whereby copper-zinc-silver ores may be treated with high recovery of each of the metals.

Ammonia-Cyanide Method Possible

A possible method of handling this ore is to grind it first and then roast at a low red heat, giving a sulphating roast. The product may then be slimed, dry, if possible, mixed with sufficient lime to make it alkaline, and then the whole pulped in water. These metals would then be in the form of hydrate, which might be then carbonated by treatment with CO_2 and dissolved in an ammoniacal solution, preferably made up of ammonium carbonate. The ammonia may be made up directly in cyanide solutions and recovered by distillation, whereby oxides of copper and zinc are precipitated without injury to the cyanide solution. This solution may then be handled by the ordinary methods for precipitating from cyanide solution and the precious metals recovered in that way.

As far as ammonia itself is concerned, its use in ore treatment has been attempted by a number of independent workers for many years past. Schnabel undoubtedly was the most successful. Hirsching made quite an effort eight or ten years ago, but, due to lack of practical experience and money, he failed. It was through investigations of the Hirsching process that the modern efforts to treat complex ores containing lead, zinc, copper and silver was thoroughly studied, and it may be said, developed. D. Mosher, of San Francisco, has done the most work in ammonia cyanidation, and is said to have successfully treated some zinc-copper ores containing precious metals by the process. It appears in no way extravagant, and there is reason to believe that with thorough technical investigation it might be made altogether practicable, if it is not already so.

Arsenic and Antimony Objectionable But Not Prohibitive

Ores containing arsenic and antimony are generally supposed to be difficult to cyanide, but in many cases it is being successfully done. Neither arsenic nor antimony appear to react very strongly with cyanide, most objections to their presence coming from the decomposition products of the sulphide of either element. Arsenical ores usually give a good extraction when treated by the usual method, but in some cases may require extremely fine grinding to give up the maximum percentage of precious metals. Antimony acts very much the same, both elements exerting, apparently, a reducing effect upon solutions, robbing them of their oxygen and forming decomposition products which are destructive to cyanide. Strongly alkaline solutions are believed to be more effective in treating ores containing these elements. In some cases where cyanidation cannot be practiced directly on ores which contain arsenic and antimony, particularly in the sulphide form, some preliminary treatment may be resorted to, which will do away with the elements themselves or put them in some form which will not be particularly objectionable. Roasting or acid treatment, followed by alkaline wash, may be effective at times.

Tellurides Now Successfully Treated

Great difficulty was originally experienced with the attempt to treat telluride ores by the cyanide process. The ores of the Cripple Creek district, in Colorado, are an example of this class. It seems that the telluride, while itself not particularly destructive to cyanide solutions, forms a combination with gold which is almost insoluble in straight cyanide solutions. Tellurium does not react with cyanide usually and perhaps only slightly in extremely alkaline solutions. Fine grinding of the ore seems to be beneficial in enabling an economically satisfactory extraction, but, for thoroughly satisfactory commercial results, bromo-cyanidation is usually resorted to. In fact, with Cripple Creek ores, this seems to have been the only means by which the gold telluride can be attacked and dissolved. As a matter of fact, in the present treatment of Cripple Creek ores, the process is mainly straight cyanidation after which a light bromo-cyanide treatment is given to the material which has resisted the action of ordinary cyanide. The additional extraction gained by the bromocyanide treatment, while extremely small in proportion to that gained with straight cyanidation, is important on account of the low grade of ores being treated, which require the recovery of all possible values in order that commercial success may be obtained.

Carbon or carbonaceous material is extremely objectionable in cyanide treatment, but, of course, this cannot be said to be an essential combination in any ore. As a matter of fact, it does occur in large numbers of accumulated stocks of ore and in tailing piles that have been standing a long time. In order that treatment of such material may be economically successful, the carbonaceous matter must be removed, or oxidizing agents must be used to minimize its reducing effect.

Rare Forms of Sulphur May Be Objectionable

It is well known that both sulphate of magnesia and sulphate of lime decompose cyanide solutions. The mineral kieserite, having the composition $MgSO_4 + H_2O$, is not rare and is but slowly dissolved in cold water. Hydrated sulphate of calcium, or gypsum, is also common, but it interests us more because sulphate of calcium is produced when the acidity in tailings and slime is neutralized with lime. Alumina also is taken up in cyanide solutions to some extent, so that probably some aluminum sulphate or double sulphate exists in some ores. An ordinary analysis of a sample of the ore to be treated by the cyanide process is nearly useless. Analysis showing the content of iron, sulphur, magnesium, etc., is no help whatever to the cyanide manager, as his knowledge must tell him what will take place when the finely crushed ore comes in contact with an ordinary cyanide solution. The analysis of an ore may not show magnesium sulphate, for instance, although small quantities of magnesia may be found, and sulphur may be believed to be in form of sulphide, when it really exists in some form much more objectionable.

Ferric arsenate is not a rare mineral. It occurs often in conjunction with limonite, a hydrated ferric oxide. Possibly these minerals when formed together are the result of the oxidation of arsenical pyrites. Scorodite has the formula $FeAsO_4 + 2\,H_2O$. It is insoluble in water, but soluble in weak hydrochloric acid. SO_2 in solution also acts upon it. Finely ground mineral containing

scorodite, left in contact with a weak caustic-soda solution, will form arsenate of sodium and cyanide of sodium or potassium acts in the same way, accounting for the slow and continuous decomposition of cyanide solutions when treating ores containing arsenates. The arsenates formed are reduced in the zinc box and remain in the precipitated gold. They may be dangerous in acid treatment.

Some Manganese Ores Altogether Untreatable

Ores containing manganese have been the subjects of experiments in connection with cyanidation for a number of years. It is a strange thing, but, nevertheless, a fact, that many ores containing manganese in various combinations can be, and are, cyanided with greatest ease, while other ores of apparently the same composition resist treatment. Many of these ores do not contain any rebellious elements except the manganese, but many of them have absolutely defied successful treatment. They can all be so treated as to give good results in the laboratory by roasting, acid treatment, or by some other method whereby the chemical combination of silver and manganese, which is the principal occurrence, can be altogether changed, but these methods are by no means practical and have never been applied. Those ores which have resisted practical treatment are few in number, but at present there seems to be no hope of overcoming the obstacle. No one knows just exactly what the trouble is, as other manganese-bearing ores are rather easily cyanided, or at least, do not present insuperable obstacles.

Nickel and Cobalt Ores Now Successfully Cyanided

Nickel and cobalt combinations have generally been considered difficult to treat. While there is no information at the present time to change that opinion, it is certain that such ores, however difficult to beneficiate, can be and are being treated successfully at the present time. Only a brief survey of the work accomplished at the Cobalt district of Ontario in cyaniding silver-bearing ores is necessary to demonstrate practically that these extremely complex ores carrying nickel, cobalt, manganese, and many other elements are being cyanided satisfactorily. As has been noted[1], many of these compounds are soluble and may be separated from the solution after precipitation in zinc boxes. Undoubtedly they are, to a certain degree, detrimental to the solution, as they must consume cyanide, but the consumption has not been so great as to prohibit successful work.

Cyanide Field Has Widened Rapidly

In summing up the discussion of ores which may be amenable to cyanidation, the first thing which attracts the attention of those conversant with the history of cyaniding since its inception, is the enormous width of the field at present compared to what was originally expected. At first only gold was considered susceptible to cyanidation, and at that only free gold in clean, siliceous ores. Then more refractory gold ores were undertaken and successfully treated, the process passing gradually to silver ores. The halogen compounds of silver, such as chloride, bromide, etc., were always easy to dissolve in cyanide solution and their treatment has never offered any difficulties. The sulphide, however, did offer an obstruction to successful treatment for a long time, and it may be said that it is only within the past eight or ten years that it has been successfully done. As a matter of fact, most of the low-grade silver ores in Mexico, which is being treated by the cyanide process, is in the form of sulphide, and certainly the production from that source is extremely great at this time. Even the concentrated silver sulphide, which almost always contains arsenic and antimony compounds, is sometimes treated by itself with cyanide solution, maximum extraction being often obtained at less cost than if the material were shipped to smelters and treated in the blast furnace. With the remarkable progress of the cyanide process in sight, it is difficult to say where the end will be, and certainly we may not legitimately place any limit upon the class of ores which will probably be successfully handled by it within the not very distant future.

Probably the most promising line of improvement in the direction which will naturally suggest itself to every operator after having read E. M. Hamilton's article upon the use of aluminum dust in precipitation at the Nipissing mill, in Cobalt, Ontario[2]. What naturally occurs to the mind is that even the baser metals contained in many ores may be commercially extracted if it can be assured that after removing the metal from the cyanide combination, the cyanide will be returned to the solution for further use. This field seems extremely promising and I expect to see much development in it within a short time. Another development, which may be more or less combined with aluminum precipitation, is the ammonia-cyanide treatment of copper-, lead- and zinc-bearing ores, of which large quantities exist, now altogether useless to its owners. There is no reason why successful treatment of these ores should not be accomplished, and I fully expect to see it done at some time.

[1] Nipissing high-grade mill, "Eng. and Min. Journ.," Dec. 14, 1912.

[2] Aluminum Precipitation at Nipissing. "Eng. and Min. Journ.," May 10, 1913.

Mesabi Range Notes

Duluth Correspondence

Minnesota mining men confidently look for another good year for the iron industry in 1914. This will mean a fair degree of activity at the underground mines of the lake region, during the coming winter, and consequent extension of the present prosperity in the mining towns and cities, for an indefinite period. Prosperity has been more nearly uniform in the mining communities of this region ever since the Steel Corporation was established. There have been none of the occasional sharp reactions from great prosperity to almost absolute inactivity, or *vice versa*, which was characteristic of the iron-mining industry before the Steel Corporation was organized.

W. H. Harvey, inspector of mines for St. Louis County, and Capt. P. L. Ramquist, inspector of mines for Itasca County, both on the Mesabi range, have just issued their reports for 1912. A total of 30,101,451 tons of iron ore was shipped from St. Louis County, of which 16,651,773 tons were mined from underground, and 18,449,719 tons were mined from openpits. Including men on stripping, the industry in St. Louis County employed 16,048 men. There were 44 fatal accidents and 76 serious ones. Itasca County, that division of Minnesota in

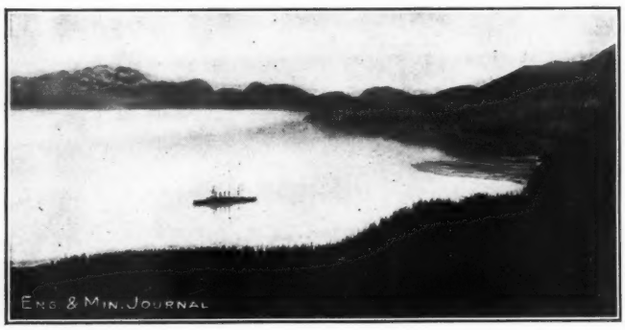
which the "Western Mesabi" is located, shipped 5,464,649 tons of iron ore in 1912. The number of men employed was 2306. The inspectors report that the Safety First policy of the mining companies is greatly reducing the number of accidents to employees. Many of the accidents are due to untrained foreigners. The mining companies have difficulty in getting sufficient trained miners.

Steel for the construction of the new ore dock of the Duluth, Missabe & Northern R.R. is arriving in quantity, and work has been begun in placing it in position, at the western end of the great structure. This dock will cost, it is estimated, $2,750,000, and will be entirely of steel and concrete. The dock will be ready to go in commission the spring of 1915.

New Laws and Transportation in Alaska

SPECIAL CORRESPONDENCE

The new Alaska mining laws which went into effect Aug. 1, 1913, are causing no end of comment throughout the territory from the fact that but few copies of the laws were published and these are held by a few lawyers. Prospectors are doubly anxious at this time to become acquainted with the new laws on account of the new discovery on the Shushanna. It would be exceedingly inconvenient for a miner to stake a claim in that district and on coming out find that he would have to get another slab of bacon and "mush" back in order to do his assessment work before he could lay claim to his property.



CRUISER "MARYLAND" IN RESURRECTION BAY, ALASKA

The essential parts of the laws as passed Apr. 30, and in effect since Aug. 1, are as follows: That during each year and until patent has been issued, not less than $100 worth of labor shall be performed or improvements made on, or for each and every 20 acres or fractional part located; that the owner of the property shall make affidavit of such improvements setting forth the name or number of the claim, the number of days' work done and the character and value of the improvements, date of performance of such work, the place where such work was done, at whose instance the work was done, the actual amount paid for such work and by whom paid and such affidavit shall be filed with the precinct recorder not later than 90 days after the close of the calendar year in which the work was done. Upon failure to comply with this section, the claim shall become forfeited and open to location by others. Furthermore it is provided that no person shall locate placer-mining claims for more than two individuals under power-of-attorney or for himself in one calendar month. Within 90 days from the date of discovery, and prior to the filing of the certificate of location the locator, shall perform the equivalent of $100 worth of improvements for each 20 acres or fractional part. According to Sec. 17, the locator shall record with the recorder of the precinct where the claim is located, within 90 days after discovery, a certificate of location, which shall contain the name or number of claim, the name of the locator or locators, the date of discovery and posting of location notice, number of feet claimed in length and width and shall also set forth a description of the location of the claim with reference to some natural object, permanent monument or some well known mining claim. There are, of course, heavy penalties attached for false swearing to affidavit of location and of annual assessment work done. There will, no doubt, be much confusion as a result of these new laws from the fact that there are few in the territory who are aware of their purposes.

The poll-tax law is not the only measure passed by the late legislature that is being objected to and fought. Another measure, the tonnage tax, is causing complaint from the steamboat men that is being heard from Ketchikan to Nome. The legislature passed a bill which requires the customs service to assess a tax of 10c. per ton on all freight shipped into or out of Alaska. Collector Willis, of the Alaska customs service, raises the question that it is not in the province of his office to collect such a tax, and is accepting no cash from the companies, but is requiring the captains of each steamer to file an affidavit of the amount of cargo on board each vessel pending the decision by the department as to whether his office should collect the tax or not. While 10c. per ton does not seem much, still it will amount to fully $200 per month for each vessel operating in these waters, or probably $3000 per year. This, of course, the consumer will have to pay. However, all the freighting companies of Alaska are preparing to fight the law to the last court.

It is a hopeful sign that there are many men in all parts of the territory looking for gold and copper properties and is indicative of the revival of interest on a broad scale. Alaska has been under a cloud for some time, due in part to governmental policies, and the bottling up of the country in the cause of so called conservation. Some parts of the territory are going through a process of evolution; placer mining is being replaced by quartz mining and necessarily the development is somewat slow. For all that substantial progress is being made and there is a spirit of hopefulness abroad in the land.

But while this is undoubtedly true, it does not lessen the fact that railroad transportation is a prime necessity to the development, growth and permanent prosperity of Alaska. The opening of the interior regions by railroads would bring certain prosperity to a rich and fertile portion of Alaska and would incidently benefit the entire territory.

TRANSPORTATION NEEDS OF ALASKA

"Cheaper transportation is the greatest need of Alaska at present, and the solution of the transportation problem will do more for the development of this immense country than any other one thing. To this end I will urge the appropriation of $1,000,000 annually for 10 years, to be spent in building highways and trails. This is

to supplement the trunk railroad line provided for in the bill now before Congress, and which I fully expect to see passed at the regular session." This statement was made by J. F. A. Strong, governor of Alaska, who had returned to Juneau, Sept. 1, on his way out to the States from the first official journey of inspection over the territory.

"I don't believe the railroad bill will be passed at this session of Congress, but we are all confident that it will be passed at the regular session next year. However, in my annual report to the Department of the Interior, I will urge the appropriation of this $1,000,000 for the construction of trails and highways annually for the next 10 years. We need roads and we need them badly. We must have highways leading from the main centers to the remote districts so the prospectors and miners can get their supplies in. When we get these roads there will be a big development. Immense areas known to contain minerals will be tapped, and the people of the United States will have their money returned to them ten-fold.

"Every bit of money obtained and spent in Alaska for roads by the Government has been obtained by subterfuge. There has been an annual appropriation through the war department for the building and maintenance of military roads and trails, with the result that we have some fairly good roads and some passable trails. I call it a subterfuge, as there will never be any need for military roads in Alaska.

"There are other things, such as the opening of the coal fields and a change in the land laws to make things easier for the farmer, that will be touched upon in my report to the Department, but I have not fully formulated these yet and I can say nothing about them. Transportation will get the most attention, for, in my mind, this is the greatest problem confronting us."

Geology of the Woody Copper District, California

By William H. Storms*

The Woody district is located in Kern County, Calif., in the low foot hills bordering the upper San Joaquin Valley, about 30 miles northeast from Bakersfield. Copper ore has been discovered and developed somewhat over an area about four miles east and west and two miles north and south. The country rock is granite, composed principally of quartz, orthoclase, plagioclase and biotite. One mile northeast of the postoffice at Woody is a large outcrop of black crystalline rock in which hornblende is the most conspicuous mineral, quartz and feldspar being present in only small amounts. There appears to be no relation between this rock and the ore. The granite is often extremely friable locally, particularly in the vicinity of ore deposits.

Numerous irregular intrusions of aplite intersect the granite, varying from small dike-like stringers to large bosses. This in some places is sufficiently siliceous to be termed alaskite, and in extreme instances is practically nothing but quartz. It is usually hard and firm and occurs in the vicinity of all the known copper deposits; in the Greenback mine an aplite dike cuts the zone of mineralized granite which it also faults. There may also be found large dikes of pegmatite, showing bluish watery quartz, cream-colored orthoclase and black tourmaline, with some muscovite. From one or two places this feldspar has been mined and shipped. One of these dikes may be traced for a distance of a mile on the surface.

The copper ore occurs in irregular masses, resulting from the impregnation of the granite by cupriferous solutions, which followed along the sheeting planes and fracture joints of the rock. All the granite is sheeted in an east-west direction with a south dip. The copper occurs where the sheeting is most pronounced. The aplite intrusions do not conform to the structure of the sheeting, but cut the granite usually in a north-south direction, although many other strikes can be seen.

The outcrops of the ore are not noticeable, nor does the ore extend strongly to the surface. Near the west end of the district is a shaft from which a shipment of several thousand dollars worth of ore is said to have been made. While the granite here is a little more decomposed, it is not highly differentiated from the granite in the rest of the district, showing no iron outcrop, and only the faintest copper stain. Many other places in the district which look more promising have not been developed.

The Greenback mine has a rusty-looking, somewhat siliceous outcrop, showing only a slight trace of copper. Of the two shafts on the property the most southerly was sunk in an opencut where a little copper stain appears. The other shaft struck ore at 60 ft. and has developed some copper. It is intended to connect the two shafts on the 200-ft. level, and either ship or mill the ore extracted. According to shipping receipts the mine has produced over $40,000 in high-grade copper ore. A little silver is always present. The principal copper minerals are malachite, a little azurite, cuprite, black oxide, and in depth chalcopyrite and bornite. Unquestionably, the normal mineral is chalcopyrite.

About a mile southwest of the Greenback mine on the north side of a high ridge are several iron outcrops. They take the form of veins from 10 to 20 ft. wide, occurring within a zone 200 ft. wide. They have been developed so far with only a few shallow pits. There is no showing of copper, except in one or two places where there are indications that the mineral is present under the leached zone. The iron minerals are limonite, hematite and magnetite, and several metaphoric minerals were noticed, notably, garnet, chloropal and opaline silica.

The mines at Woody are dry, the region being a semi-desert. Certain points of similarity will have been noticed in the description between this district and the Butte district, particularly in the similarity of country rock, granite, which is highly fissured where ore deposits are found, in the pegmatite and aplite dikes, and in the lack of outcrops of the copper ores.

*Mining engineer, 2437 Hilgard Ave., Berkeley, Calif.

Deterioration of Firebricks in Service

G. Rigg has investigated the causes of the deterioration of firebricks during use (*Journ. Ind. Eng. Chem.*, p. 549, 1913), and concludes that other things being equal the resistance to the action of corrosive slags and gases is greater the more compact and close-textured the brick is. "Spalling" of close-textured brick is due to the use of unsuitable clay, or poor workmanship, or both. It is possible to prepare close-textured firebrick containing considerable amounts of coarse material, provided that sufficient care be taken in sizing the grog, so that the interstices between the larger fragments shall be filled as completely as possible by smaller fragments.

The Minerals of Bolivia

SYNOPSIS—A résume of the geology of the mountain districts of Bolivia in which minerals occur. A note on the condition of the mining industry, mentioning the metals produced, and describing the various ores and their occurrence.

❖

Among the countries which furnish minerals to the world's markets, Bolivia occupies an important place. Not alone the quantity of its minerals, but also their variety, attracts the attention of those who know its great richness.

There are two principal mountain ranges in the country, one on the coast and one, known as the Cordillera Real, in the interior. The latter is the only one which has any importance in connection with mineral production. Between these two ranges there is a high tableland which contains deposits of borax and nitrates.

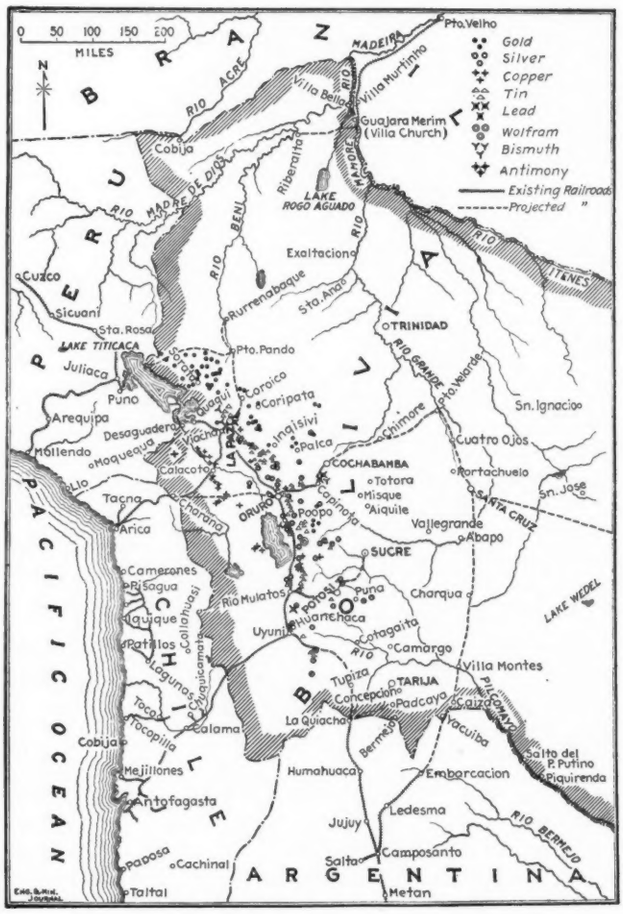
Mountains Formed of Folded Sedimentary Rocks

The Cordillera Real was formed by different sedimentary rocks, which were originally laid down horizontally, or very nearly so. These rocks are the black, green and greenish slates, red and green sandstone, limestone and dolomite, and in some places marble. Less frequently there are deposits of gypsum, but these are rarely important. All of these sedimentaries belong to the Silurian formation, which has been deposited on top of Cambrian beds, and have for a base the older granite, which in some parts, as for example in the Illimani, are exposed at the surface.

The Silurian slates are overlain, in a few regions, by less heavy beds of Devonian and of the Carboniferous epoch, the latter at times occurring directly over formations much older. There is little doubt that more recent formations exist in the regions of Corocoro and Carangas. All of these beds are covered by alluvial deposits. The relative scarcity of fossils in all except the Devonian beds makes the determination of the age of the formations difficult, and only by careful and close study are the beds differentiated. The area which formerly was level and now constitutes the tableland and the chain of mountains in Bolivia and neighboring countries was completely transformed by two great movements which formed the mountain range and inverted many of the formations. The movements which occurred in all South America formed colossal mountains, valleys and cañons. Great masses of eruptive rock were thrown out from the interior of the earth and extreme and complex folding occurred. As disturbances grew less, the active volcanos became extinct one by one, and in the higher mountains snow accumulated and turned to ice. Here, then, glaciers were formed, which carried drift for great distances and formed the moraines and conglomerates which are found in all parts of the country. With the passing of the glacial epoch, the South American countries, including Bolivia, took on their present appearance.

Metal-Bearing Veins Near Eruptive Rocks

As a result of the eruption in the Cordillera Real, a number of volcanic rocks appear at the surface, especially trachyte, rhyolite, and in smaller quantities, andesite and dacite. The eruption also gave place to the formation of veins of mineral which are today so important to the Bolivian mining industry. Regarding the method by which these mineral deposits were formed, there is a difference of opinion. Some authorities adhere to the theory of infiltration from below, others that the filling came from gases and vapors, mineral-bearing waters, concentration from sedimentary rock, and in short, all the theories which have been proposed to account for mineral deposits in various parts of the world. There is very little doubt that many different causes are accountable for



Map of the Mineral Region of Bolivia

the mineral deposits of Bolivia, as it is clear that those of different regions have been formed by different agencies. The deposits vary in composition of their minerals as well as in their structure and form.

The most important mineral deposits of Bolivia are those which contain tin, wolfram, bismuth, silver, gold and copper. Lead and zinc, although encountered in quantities, are important mainly for the silver they carry.

Tin Occurs Principally as Cassiterite

The tin deposits are in veins and the metal occurs in the form of cassiterite, pure and together with iron hydrate, pyrite, and more rarely with chalcopyrite. Cassiterite also occurs mixed with minerals of silver, such as native silver, and cassiterite associated with wolframite,

Note—Abstract of an article in the "Boletin de la Sociedad Nacional de Minera," Chile, March and April, 1913.

magnetopyrite, arsenopyrite, marcasite, chalcopyrite and occasionally with native bismuth, lustre bismuth and also with scheelite. Very often the tin minerals occur practically pure in separate streaks, beautifully crystallized, especially in the upper part of veins. Other veins, on the contrary, contain very impure tin, due to the oxide of iron and other minerals which are mixed with it, more or less disseminated through pyrite, quartz and other rock. Some vein filling is brecciated, formed of quartzite or pieces of slate impregnated with the tin mineral. The true tin-bearing rock is generally sandstone and frequently quartzite also, and at times both of these are metamorphosed. It rarely occurs that veins or fissures are found in the eruptive rocks, or in the contacts between the slate and sandstone, but sometimes the country rock is partly impregnated with tin.

Sometimes tin minerals are found in veins in pure state, but the general opinion is that the existence of eruptive rock in proximity influences favorably the formation of veins of tin. The size of these tin veins is quite variable. Some of the smaller ones are only 1 or 2 mm. wide, while others are large and strong, up to 5 and 6 m. in width. Pockets of tin ore have been found having a width of 10, 20 or more meters, but they are usually nothing more than lenses diminishing in size in all directions. It may be said that the majority of the tin veins have a width of from 30 cm. to 1 meter.

Tin and Silver May Occur Together

Tin is usually accompanied by silver minerals, and the ore is particularly rich at or near the surface, diminishing in content of that metal with depth. Tin sometimes contains from 0.6 to 0.10% of silver.

While in many cases there is no sign of pyrite on the surface of tin veins, it soon appears with depth and increases as depth is increased. The content of tin in ore varies greatly in different veins; some contain only extremely minute quantities, while others run from 4.5 to 12%. Some ores are known which carry as high as 20, 40, and even 60% tin. The majority of tin-bearing veins are formed of hard rock, especially those which have a brecciated structure, and those which are accompanied by quartzites, or which have impregnated the eruptive rock. Other veins, on the contrary, consist of an argillaceous mass in which large and small pieces of tin ore occur. The tin veins usually appear in groups or series of veins more or less parallel. More rarely, separate and distinct veins lie in contact with each other. The large and important mines are found in those parts of Bolivia which have an altitude of 3000 to 5000 m. above sea level, and are almost exclusively in the departments of Oruro, Potosí, La Paz and Cochabamba.

Silver in Practically All Its Known Forms

Silver-bearing veins are of great variety. The metal occurs in galena, blende, pyrite or arsenical pyrite, chalcopyrite, antimonides, arsenides and ruby silver, native silver and other rarer combinations. It occurs frequently in combination with tin, and in this case, of course, is in connection with the rocks already described as tin bearing. Occurrences of independent silver deposits, however, are known, which have no connection whatever with tin and are in altogether different formations. To the purely silver-bearing formations belong the celebrated mines of Colquechaca and Pulacayo, which in their time produced colossal amounts of ruby silver, native silver, arsenide, antimonide and other silver minerals of extremely high grade. At the present time these veins contain principally galena, blende, chalcopyrite and pyrite, which has only a small quantity of silver. From time to time, pockets are found which contain small pieces of the very rich silver ores, which have already been mentioned. With depth, the amount of silver diminishes, so that very little is now produced. Their working depends upon concentration of these low-grade ores, the concentrate being treated by lixiviation, and the silver sulphide exported to Europe or North America for smelting.

There are in Bolivia a great many veins containing blende and galena altogether independent from each other, and frequently showing extreme strength and great richness in these minerals, although containing only a small amount of silver, which would not pay to work for that metal alone. The principal producers of silver at the present time are the Compañia Minera de Oruro, which also is one of the principal tin producers, Compañia Minera de San José, Compañia Minera de Huanchaca, and other mines in Colquechaca, Porco and Potosí.

Much Native Copper Exists

Copper is found in Bolivia in veins and beds, both containing native copper. The vein deposits have been formed by a process analogous to that by means of which the veins of blende and galena were formed, but are much weaker. Copper veins are generally found in the slate and sandstone, and at present time are practically unworked. Of greatest importance to the country is the existence of native copper, especially in the region of Corocoro. At present, two large companies are working there, the Corocoro United Copper Mines, Ltd., and the Compañia Corocoro de Bolivia, in addition to other small mines. Copper occurs in gray sandstone, red clay, gray and red conglomerate, all of which contain more or less strong impregnations of gypsum and pyrite. Between the sandstones, clays and conglomerates, the contact deposits of copper are found, these rocks having been impregnated very frequently with native copper. Sometimes the copper-bearing rock is in layers of different widths, frequently from 2 to 3 and up to 10 or 12 m., and the native copper is often found in the image of plants or trees upon the rock, and also in large and irregular pieces. These latter are called *charquis*. The impregnations, especially in the sandstone and conglomerate, were evidently formed at the same time that the irregular pockets were being deposited in the red clay.

Rare Copper Specimens Occur

Beautiful crystals and groups of crystals in aragonite have been found, and also pseudomorphs of native copper and aragonite. Many beautiful crystals of barite have been formed with metallic minerals, and little pockets filled with fine galena, cuprite, malachite and azurite are often found.

In Corocoro groups of different deposits of copper are found, distinct both in composition and in width. The average grade of native copper in these beds amounts to 2½ to 3%, but in parts the grade goes as high as 10 to 12%. Another important region of copper formation is the Province of Carangas, rich in native copper, copper-lead, and minerals of lead and zinc. In spite of its rich-

ness, the district is not being worked and has been very little explored.

Bismuth Controlled by Monopoly

Deposits of bismuth occur in many parts of Bolivia, especially in the southern part of the department of Potosí. They are in the possession of Aramayo, Francke & Co., which firm has practically a world monopoly in the production and sale of bismuth. Bismuth formation is characterized by a very complicated vein filling which is a mixture of cassiterite, vitreous bismuth, wolframite, chalcopyrite and other copper minerals, some silver minerals, pyrite and magnetic pyrite. Sometimes native bismuth is encountered accompanied by native gold. The best minerals, those of greatest purity, consist principally of vitreous bismuth, mixed with chalcopyrite, and the former is really the greatest source of the present bismuth production. In the river beds of these regions there are encountered rounded pieces of native bismuth, mixed frequently with quartz crystals and occasionally accompanied by galena. Pieces of vitreous bismuth are also found, which have at times been converted, partly or wholly, into an ochre of bismuth, locally called *paco*. Aramayo, Francke & Co. has, in Quechisla, a large installation for the smelting of bismuth minerals. The bismuth, partly melted and refined, is shipped to Europe for final treatment and separation of its contained metals, especially gold, silver and copper. It is well known that other deposits of bismuth occur, but owing to the monopoly and the difficulty of marketing independently, many rich ones are idle at the present time.

Tungsten a Recent Discovery

Wolfram veins have been discovered only recently and always in the neighborhood of tin veins. The mineral is almost always wolframite, sometimes ferruginous, and sometimes mixed with niobium and tantalum, containing occasionally a mixture of these rare elements running as high as 10 to 12%. The wolframite is always mixed with quartz and frequently accompanied by arsenical pyrite and rarely with native bismuth. The deposits of Chorolque and Tazna are accompanied by minerals of bismuth, tin, silver and copper, offering the best and purest veins of wolfram in Bolivia. Their width varies between 20 and 60 cm. The crude ore carries from 5 to 20% of tungstic acid, and the minerals, when concentrated for exportation, as is usually done, yield a product containing 60 to 70% of tungstic acid. This industry, relatively new, has not reached its highest development yet, and is widening its importance rapidly. The mineral is desirable and a great deal of prospecting for it is going on at this time. There are in existence from 25 to 30 mines, small ones, which export wolfram, these being situated in the different mineral districts.

Gold and Antimony Worked on Small Scale

It might be said with truth that gold is found in practically all parts of Bolivia. It occurs both in placer deposits and in veins. Many of the Bolivian rivers carry gold in sand, and veins of gold-bearing quartz are well known in many districts. The antimony deposits, which are quite frequent in Bolivia, usually contain gold in chemical or physical mixtures. Some dredging industries are prosperous in Bolivia and quartz mining is carried on profitably, though on a small scale. The principal working for gold is in the departments of Oruro, La Paz, Potosí, Santa Cruz, Beni and Cochabamba.

Antimony occurs frequently throughout Bolivia and its deposits, as has already been mentioned, contain considerable gold. The present price of antimony, however, has been prejudicial to the mining of the metal in Bolivia and the condition of that industry is poor at present. Due to the fact that gold is contained in most of the antimony mines, some of them are utilizing that advantage to continue operations.

Other minerals exist in Bolivia but they have been very little in demand and have not been searched for. On a small scale, borax, saltpeter and rock salt are produced in various places. Petroleum is said to exist in several districts, but has never been definitely proved or commercially worked. Lignite also occurs, and while it is well known that these two products do exist, they have not been carefully studied and nothing can be said of the quantity in which they occur nor the future for their production. It is believed that Bolivia has a mineral future of exceeding promise as a great number of valuable minerals occur and the country has been very little searched. It is hoped that the future will bring an additional amount of prospecting and consequent development of the great mineral resources.

Metal Production in the Eastern States in 1912

A review of the metal production of the Eastern States for 1912 is given by the U. S. Geological Survey. The total output of gold, silver, copper, lead and zinc in the Eastern or Appalachian States, in 1912, was $222,496 of gold, $96,523 of silver, 19,265,945 lb. of copper, 561,026 lb. of lead and 144,699,863 lb. of zinc.

The gold output declined in all states except North Carolina, in which a substantial increase was made. Production of silver was 96,523 oz., a decrease from the 1911 output of 11,582 oz., but an increase of $2065 in value. This silver production is entirely from the refining of gold, lead and copper produced, and the bulk of it is from the copper ores from Ducktown district, Tenn., where there was a decrease of 16,767 oz. in 1912.

The great bulk of the copper production was, as usual, from the well known Ducktown district of eastern Tennessee, the remainder coming from Pennsylvania, North Carolina, Virginia and Maryland.

The lead production was chiefly from West Virginia, as usual, but 92,000 lb. were produced also in North Carolina. The zinc output of the Eastern States, shows a slight decrease from 1911. The production was mainly from New Jersey, as it has been for many years, but there was a large production also from Tennessee, where the output doubled in 1912, and there was considerable yield from Virginia and North Carolina.

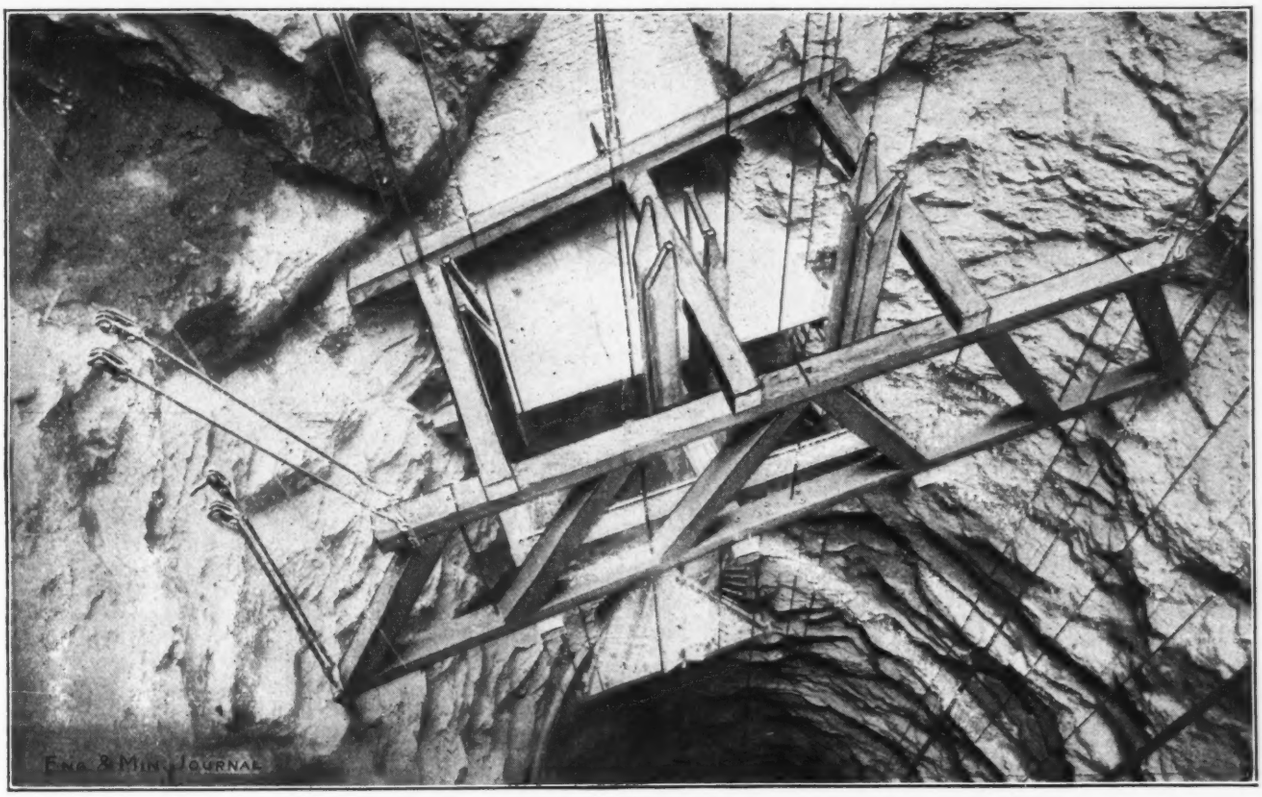
A Rope Breakage Due to a Spinning Bucket is reported by an inspector of the Queensland Department of Mines in the anual report for 1912. The accident itself was not serious, the bucket having been hoisted to the surface and the doors closed when the rope broke. The inspector states that, in his opinion, a spin was set up in the rope as the bucket left the bottom and this motion, being confined to a short space when the bucket reached the surface, was sufficient to cause torsion and shearing of the rope between the bucket and the sheave.

DETAILS OF PRACTICAL MINING

Station Suspended in a Circular Shaft

By Douglas Muir*

The photograph reproduced herewith represents a station of the Rayas shaft previously described in the Journal[1] and illustrated with a drawing. The picture was taken looking down from a position above the ore-pocket level. The upper opening in the rock is the cross-cut to the ore pocket and the lower opening with the flaring platform is the manway. A wire-rope ladder can be seen connecting the two levels. The construction and method of support of the station truss is clearly shown, as well as the rigid wood guides for receiving the cage from the wire-rope guides. The manner of fastening the hangers in the rock is well exhibited. The bridge across the shaft mentioned in the previous article was built of two similarly constructed trusses, similarly supported.



Station in Rayas Shaft, Showing Suspended Truss

❖

End Plates and Wall Plates are Often Cut 1 In. Short at Butte, ½ in. being taken off the framed portion at each end ("Bull. A. I. M. E.," August, 1913). The object of this is to insure that the miter edges on the two plates will be drawn close together when the set is blocked. Thus a wall plate for a shaft 20-ft. long would be 19 ft. 11 in. The inside dimensions would remain the same. In order to hold the set together when it is being blocked, 1-in. wooden pins are driven at each corner in holes bored for that purpose. Such pins are made by driving 1-in. square blocks of wood through a 1-in. round hole in iron 1 in. thick.

*Mining engineer, Guanajuato, Mexico.

[1]"Bailing through an Untimbered Shaft." Eng. & Min. Journ., May 17, 1913.

Combination Drill Carriage and Mucking Belt

In one of the headings run from the Maplewood Ave. shaft of the Mount Royal tunnel, which is being driven to admit the Canadian Northern to Montreal, a drill carriage is used and has given excellent satisfaction. The carriage is a rather massive affair, built largely of steel sections and carrying a crossbar of suitable dimensions for the 8x12-ft. heading, which is being driven (*Mine and Quarry,* July-August, 1913). Four heavy Sullivan water drills are mounted on arms which are themselves clamped to this crossbar. The crossbar may be advanced 20 ft. ahead of the frame of the carriage. The lower part of the machine comprises a belt conveyor, which may be advanced 8 or 10 ft. ahead of the frame. In use, after a round is fired, the muckers go ahead of the machine and clean the muck from the track, which is riveted to a steel plate. When the machine is brought close enough to the heading to position the bar carrying the drills, the drilling is begun and is finished with one position of the bar. Mucking goes on simultaneously with the drilling, the muck being shoveled on the conveyor, which can be brought forward so as to be always close to the muck pile. The belt rises at the rear end, and is arranged to dump the muck into the cars. For a period

of five months in the spring of 1913, the average monthly advance was 344 ft. without a carriage. In the succeeding month, during the most of which the machine was in operation, the heading was advanced 510 ft. in 27 working days through extremely hard rock.

Butte Shaft Guides

Originally in Butte the shaft guides measured 4x6 in. in section, but there is now a tendency to increase their size to 4x9 in. and 5x9 in., these being held to the sets by 8-in. or 9-in. lagscrews. A larger-size guide can stand a heavier load and greater shock, and furthermore two lagscrews can be used in each timber. The holes for the lagscrews are placed diagonally across the guide, and after a term of service another pair of holes can be bored diagonally across in the other direction, thus giving fresh timber for the threads to grip ("Bull. A. I. M. E.," August, 1913). In some cases, as exhibited in Fig. 1, vertical guide-posts are used behind the guides between the sets to give the guides more substantial support. These are framed into the dividers, or end plates, of the

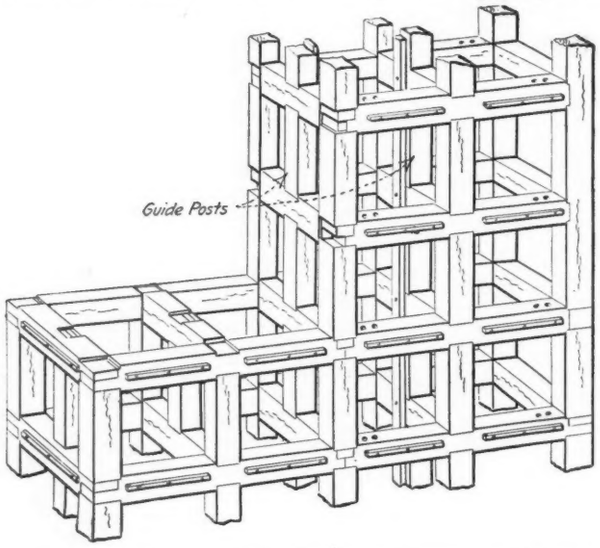


FIG. 1. GUIDES BACKED WITH VERTICAL POSTS

shaft. They are of the same width as the divider and usually 12 in. in the other direction. Guide girts, Fig. 2, are used for the same purpose, being set horizontally between posts and equidistant between the centers of the sets. In heavy ground the guide girts would seem to be more satisfactory than the guide posts.

To allow for motion of the ground, which would push in the end plate of the set, the outside hoisting compartment is often made 2 in. longer. In such case, in order to keep the distance between guides in the two compartments the same, a 2-in. wood filler is placed between the guide and the end plate, and as compression takes place, it is cut down or removed so as to keep the proper distance between the guides. Sometimes the filler may be a vertical post carried up the shaft against the end plates and bolted with 7/8-in. bolts to the guide post.

Lack of Cementing Material Makes Better Grindstones, according to Wilbur Greeley Burroughs, in "Economic Geology," August, 1913. Such stones remain sharp even after continued use. The presence of cement nearly always causes a stone to glaze and lose its cutting power, since the pores become filled with the cement. The excellence of the Berea grit, for grindstone purposes, is largely due to this lack of cement.

Don'ts for First-Aid Men

The following rules for first-aid workers are published by Allen S. Snyder, in *Coal Age,* Sept. 13, 1913:

Don't touch a wound with the hands.

Don't disturb blood clots.

Don't be rough with the patient.

Don't probe for a bullet or any other body imbedded in the flesh.

Don't wash wounds unless you sterilize the water.

Don't pull or tear off clothing—cut it away.

Don't attempt to remove pitch, varnish or wax from a burned surface.

Don't bring ammonia too close to the nostrils.

Don't touch the eye with dirty fingers or an unclean cloth.

Don't put bandages on too tight.

Don't let the patient know his condition is serious.

Classified Causes of Overwind Accidents

Overwinding accidents in the Rand shafts for 1912 are described and analyzed in the annual report of the Mines Department of the Union of South Africa. The

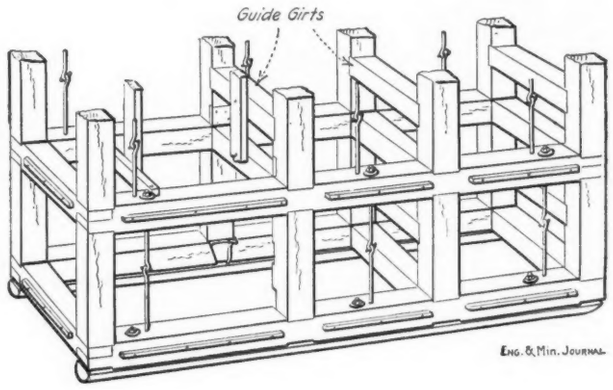


FIG. 2. GUIDES BACKED WITH HORIZONTAL GIRTS

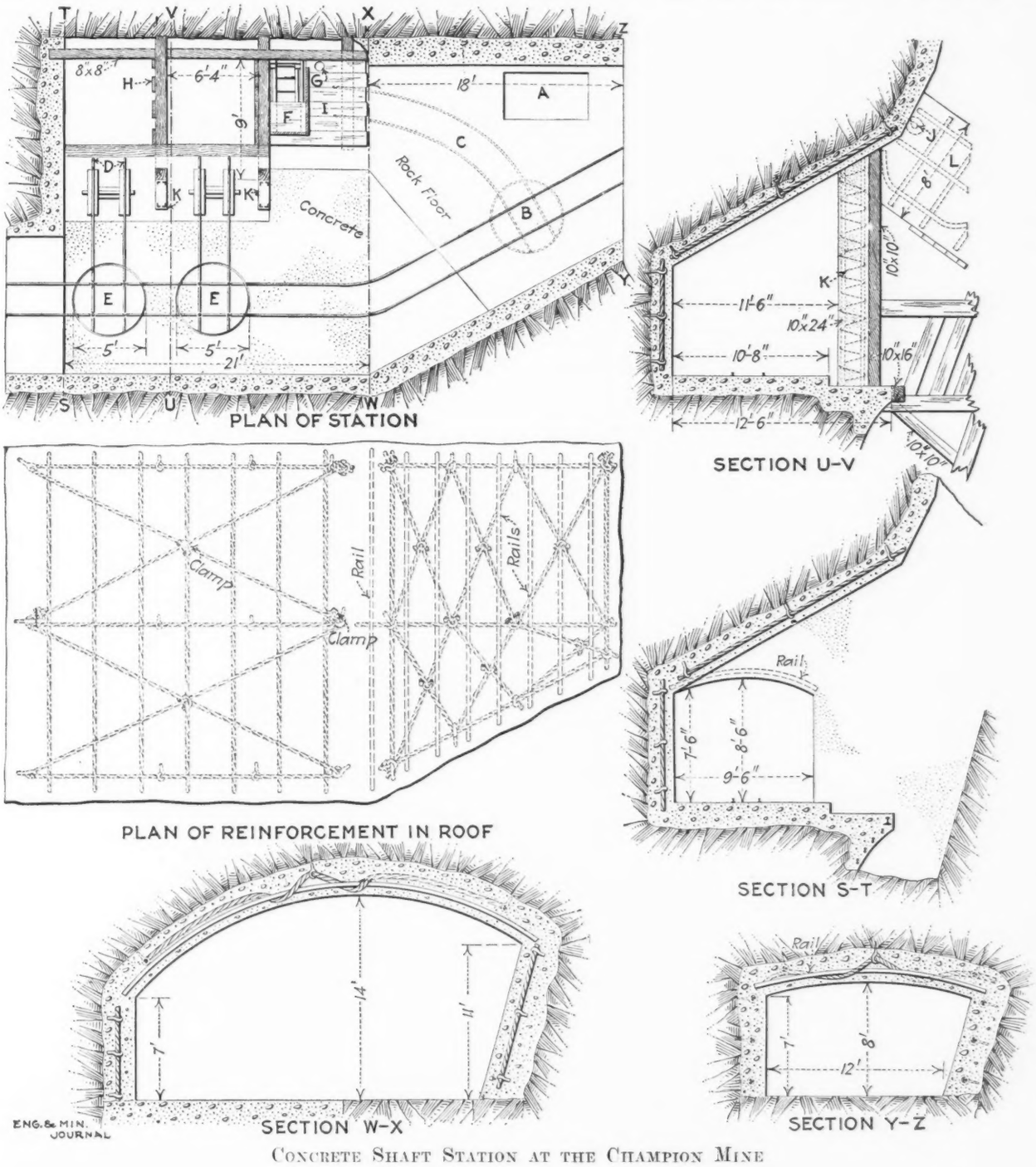
causes have been carefully considered, and it has been found that, apart from accidents of comparatively rare occurrence caused through failure or breakage of plant, at least five distinct classes in which carelessness is wholly or mainly the cause exist. These are:

(1) Starting to lower with the reversing lever in the position for raising. (2) Changing hoisting from a lower to a higher level; engineer forgetting the fact and watching the indicator of descending side. (3) Changing from skip to cage, and engineer forgetting the fact, or forgetting that persons are being raised in the skip. (4) Lowering unbalanced with electric winder on counter-current, too great speed developed, or too sudden application of reverse current, failure of resistance control of rotor, tripping of switch of stator current, and failure of single brake to control runaway drum. (5) Lowering on "compression" with reversing lever against the motion, too much compression created, cage stopping too soon or descending too slowly, and driver puts reversing lever over to the other position without safeguarding the motion with the brake.

Concrete Station at Champion Mine

The large stations of the Champion mine sometimes require concreting of the back where rather large areas are exposed. Such a station is illustrated in the accompanying drawings in plan and section. The wood timbers here shown are replaced in later stations by concrete beams or pillars. The peculiar shape shown in the plan is rendered necessary in order to provide for sinking, the hoist for that purpose being situated at *A* and a temporary turntable at *B* for a temporary track *C*. The permanent turntables *E* and the cradles *D* are placed as illustrated. The mainway is covered with 10-in. timber shown at *I*; a trap-door *F* sets in this and the 8-in. air pipe *G* passes through it. Between the skip compartments, a brattice of planks *H* is built to prevent miners from stepping off the cage into the empty compartment.

The reinforcement in the concrete roof of the main part of the station, as seen in the sections and in the plan of the roofs, consists of 1¼-in. rope. Some of this is threaded through eye-pins in the back, these being disposed as shown. This cable is drawn as tight as possible, and the ends and the crossings clamped. Above it are placed six pieces of the same cable extending in the direction of the shaft. The roof is about 18 in. thick.



Concrete Shaft Station at the Champion Mine

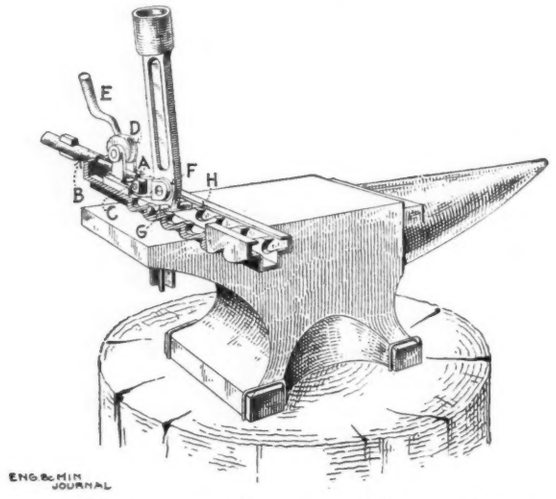
Similar reinforcement is used for the station sides, which are from 10 to 18 in. thick.

In section *UV* can be seen an eye-bolt *J*, in the brow over the shaft. One of these in each skipway is used to hold the blocks for unloading heavy timbers. The two supporting posts *K*, opposite the shaft dividers, are built of four 4-in. angles in the corners, wrapped continuously with ¾-in. wire rope, the wraps about 12 in. apart. These posts are 10x24 in. The divider in the shaft, seen at *L*, is of concrete, reinforced with 1¼-in. rope as shown.

The side extension of the station has an arched roof and includes eight 25-lb. rails in its reinforcement. These are bent to the arch of the station. Eye-pins are also set in the rock and a network of 1¼-in. cable laced through them over the rails, except that where it passes through the center pins, it is taken under the rails and up through the eye-pins again. The opposite side of the station also has a rail reinforcement in the back of the drift.

Puller for Hollow-Steel Welding Pins

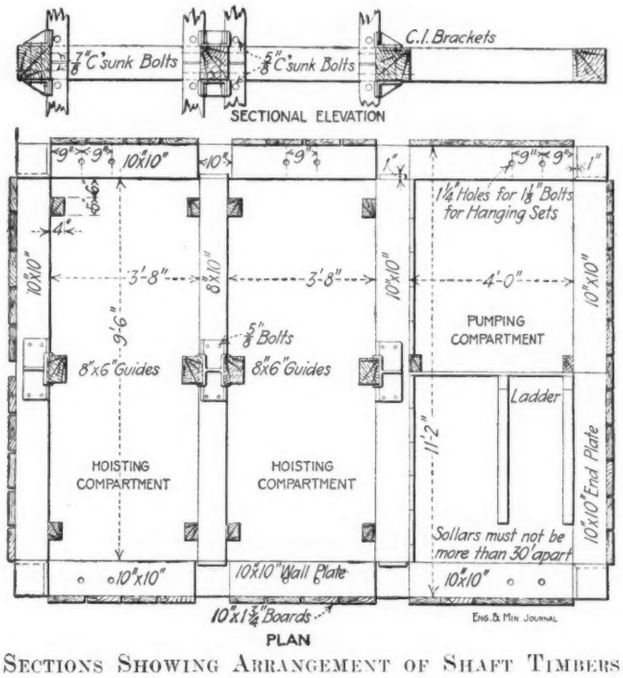
A device for pulling from the shank end of hollow-drill steel, the pin which is inserted to preserve the orifice during shanking and welding has been invented by John Q. Grant, of Denver, Colo. (U. S. Pat. 1,065,125). Ordinarily, this pin has to be driven out by a chisel, which is slow and laborious and injurious to the pin. The device as shown consists of a trough arrangement, in one end of which a slot permits the entrance of the pin *A* while opposing the entrance of the drill shank *B*, which is considerably larger. The pin *A* is gripped in a block *C*, the upper surface of which is grooved to approximately the curvature of the pin, the gripping being performed by a grooved cam *D*, the groove of which is knurled to obtain a sure grip. The cam handle *E* is bent to one side so as to pass the pulling lever. The block *C* is connected by a link *F* to a pulling lever which terminates at its lower end in a transverse pin *G*; *G* can be slipped behind the teeth *H* on the sides of the trough, which thus form successive fulcrums for the lever. The teeth slope in such a way that by reciprocating the lever handle, the pin *G* naturally slips from one set of teeth to another and the extraction of the pin is thus almost continuous. The trough in its simplest form as shown is fitted with a projecting horn below for insertion in the hardy hole of an anvil.



TOOL FOR EXTRACTING PIN FROM WELDED SHANK OF HOLLOW STEEL

Shaft Set with Powellized Guides

The accompanying illustration shows the set in use at the main shaft of the Broken Hill South Silver Mining Co., Australia. The details of the set construction are apparent from the drawings. The sets are 6 ft. 8 in. between centers. Originally, guides of Oregon pine were used, but these were found to wear excessively, and since all the hoisting was done through this one shaft, it was a matter of annoyance and expense to interrupt operations in order to replace guides. In order to avoid this difficulty, it was decided to adopt for the guides a native Australian timber called tallow-wood; this is hard, tough and close-grained. The variation in humidity conditions in shafts naturally causes swelling and shrinking of all timbers, including the guides; it was decided to minimize this by treating the guides by the Powellizing process and sawing them to gage immediately before placing them in the shaft. The shaft is downcast, and when ventilating conditions are less stable in the summer, the draft is maintained downcast by the aid of a motor-driven fan.



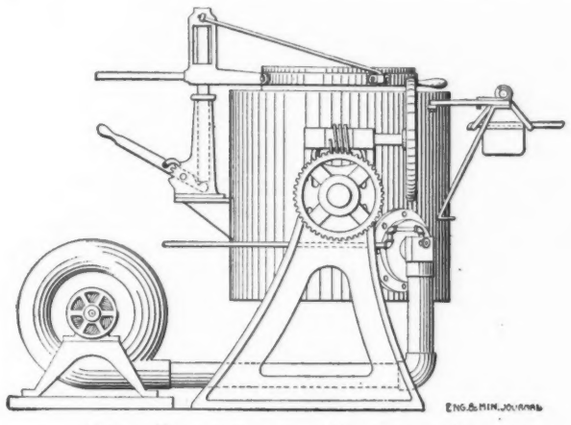
SECTIONS SHOWING ARRANGEMENT OF SHAFT TIMBERS

The Powellizing process is a method of wood treatment developed in England and consists essentially of impregnating the wood with a solution of saccharine. This is performed by the usual open-tank treatment method. The saccharine has the faculty of hardening the wood considerably, rendering it impervious to attacks by decay and by boring insects. Furthermore, it probably fireproofs the wood to a certain extent, or at least does not render it more inflammable, as does creosoting. This effect of hardening and fireproofing the timber treated should render the Powellizing process especially available for shaft guides.

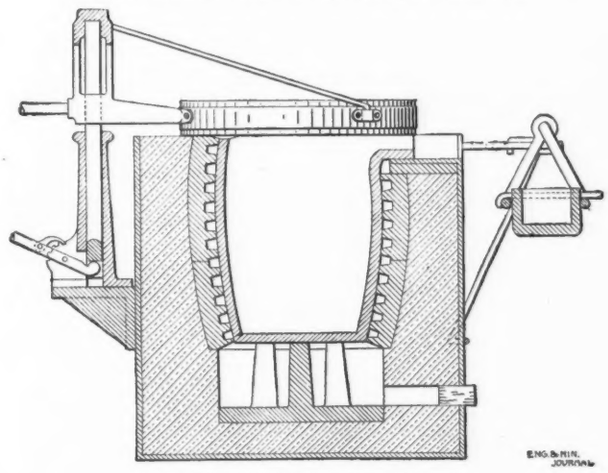
DETAILS OF METALLURGICAL PRACTICE

The Case Metallurgical Furnace

A furnace for general metallurgical uses, such as melting precipitate, bullion and other metals, has been invented by W. W. Case, Jr., of Denver. The object of this new furnace is to decrease the cost of operation, decrease loss by breakage of crucibles, and injury to the furnace lining and to obviate the usual roaring noise of such furnaces. The furnace is constructed, as is usual with devices of this kind, with an outer inclosing wall of refractory material, surrounded by a sheet-metal casing to hold the fire-proof wall together. The whole is carried on trunnions which rest in side supports, and one of these trunnions is provided with worm gearing operated by a hand wheel for tilting the furnace when pouring out its contents.



SIDE ELEVATION OF COMPLETE DEVICE



SECTION OF FURNACE PROPER

The interior of the furnace wall may be built as is shown in the sectional view presented, the advantages of which are obvious. The liner plates fit close around the crucible and are removable at will. The corrugations in these lining plates are not continuous but are arranged in a kind of checkerwork which does not oppose the passing of flame or heat about the crucible. At the top of the crucible a curved lip projects, meeting a corresponding depression in the top of the furnace wall which is designed to carry off the molten metal. The crucible bottom rests on supports, or legs, so arranged as not to obstruct the flame passage. Flame for heating is delivered tangentially with the combustion chamber. A bullion mold may be suspended from the furnace in front of the lip. The oil burner is operated by a small blower delivering blast at about a 6-oz. pressure, thus avoiding noise.

⁂

Safety Rules—Machine Shop and Machinery*

(1) Safety switches should be provided on all machinery where men are compelled to work out of view of the operator, or where it may be necessary for them to stop machinery independent of the operator while adjusting or repairing.

(2) Machines which might turn over or accidentally start should be equipped with safety locking devices.

(3) A locking device should be provided on levers operating machinery.

(4) To guard against a lever's coming off, a lock nut or cotter pin should be provided.

(5) All machines should, where practicable, be equipped with start and stop buttons, or a device easily reached by hand or foot, whereby the machinery can be instantly stopped in case of accident.

(6) All machines which are set in motion with a tripping device, when not in use, or when being adjusted or repaired, should have the power shut off or be securely locked or blocked.

(7) Do not use celluloid eye-shields, cap fronts, collars, etc., as celluloid is inflammable and is liable to ignite and cause serious injury.

(8) Goggles with mica or heavy glass lens should be provided for chippers, men working at emery wheels and whenever necessary to protect the eyes.

(9) When chipping, provide yourself with a mask and eye-shield and see that the tools are not battered; thereby you may prevent chips from injuring you.

(10) When working around machinery, do not wear gloves, ragged sleeves, loose coats, ties or jumpers, as there is danger of their getting caught in the machinery.

(11) After repairing machinery, always replace safeguards before leaving the job.

(12) Before going in an engine or pump, block the flywheel or crosshead to prevent a leak of steam from starting the engine.

(13) All oilers should know the condition of platforms and railings, and if not in safe condition, they should report the matter at once to their foreman.

(14) Avoid striking your tools on trolley rails and wires, causing shocks and flashes. Tape the handles of tools used in such work.

*From Inland Steel Co.'s book on rules.

(15) Men working on machines of all kinds should inspect them every day before starting to work and report any defect to their foreman.

(16) When removing drillings or shavings from a drill or lathe, be careful not to get caught. It is safer to stop the machine or use something other than your hand.

(17) Operators should not attempt to repair machines but should call their foreman. All machines should be stopped before oiling, wiping or repairing.

(18) Wire-mesh or perforated-plate covers shall be provided over all gears; guard should extend over both sides low enough and far enough from the gear so that no one can get caught between the gear and the guard. Provision should be made for inspection and lubrication.

Grinding Wheels

(1) Fine-grained wheels with a bond having a high tensile strength have a greater factor of safety than soft and coarse wheels. To avoid excessive centrifugal stress and possible bursting, wheels should be run within certain speed limits.

(2) The factor of safety is greatly increased by ordering wheels shaped for beveled, shoulder or ring flanges. The flange should always extend to within at least 2 in. of the wheel edge, and be of the same diameter on each side. A safety taper of ¾ in. to the foot is required on wheels over 8 in. in diameter.

(3) Axle holes in grindstones should be round; as the process of cutting square holes is to cause slight radial fracture.

(4) Wheels must be handled with the greatest care in unpacking, storing, delivering, etc., and should never be left standing on the ground or stored in wet places.

(5) Great care should be used in mounting wheels. Never force a wheel on the arbor. Use relieved flanges, compressible washers between wheel and flange, and obtain a perfect bearing at outer edge. Vibration should be avoided at all times.

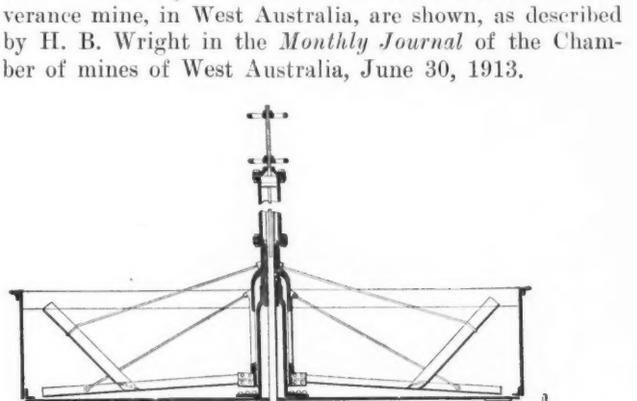
Preparation of Baryta

Preparation of baryta was studied by L. Marino and D. Danesi, *Gaz. Chim. Ital.*, 1913, according to the abstract in *Journ. Soc. Chem. Ind.*, June 30, 1913.

The object of the investigation was to devise a method for the conversion of barium sulphate at a low cost into baryta for use in the desaccharification of molasses. The communication deals with the conversion of the barium sulphate into sulphide. It is shown that reduction may be effected by various gaseous reducing agents and that per ton of barium sulphide produced, the cost of fuel (for reduction and for maintaining the requisite temperature) is Lire 18.25 (14s. 6d.) less when water-gas (at 600° to 625° C.) is employed than by the known method of reduction with solid carbon. Moreover, with the gaseous reducing agent, a purer product is obtained in a shorter time, and less labor is required. It is recommended that a long rotary furnace of iron, lined with refractory material, and slightly inclined to the horizontal, be employed, water-gas freed from carbon dioxide being used both as reducing and heating agent. (A detailed description of a small experimental furnace of this type is given.) Working at a temperature of 600° to 650° C., the size of the discharge opening and the speed of rotation of the furnace are so regulated that the barium sulphate remains in the furnace for 1 hr.; a yield of 95 to 98% of barium sulphide is obtained. The escaping gases contain only traces of hydrogen sulphide. Strontium sulphate and calcium sulphate can be reduced in a similar manner, but somewhat higher temperatures are necessary, and in the case of calcium sulphate small quantities, and in that of strontium sulphate, traces, of oxide and thiosulphate are formed in addition to sulphide.

Wright-Jaentsch Slime Agitator

Economical agitation of slime is an important part of cyanide treatment and the great number of types in use testifies to the difference of opinion as to superiority. In the accompanying drawing, the details of the Wright-Jaentsch device, as used at the Great Boulder Perseverance mine, in West Australia, are shown, as described by H. B. Wright in the *Monthly Journal* of the Chamber of mines of West Australia, June 30, 1913.



Centrifugal Slime Agitator

The operating principle is centrifugal force, the speed of the inclined-pipe members causing a suction in the bottom of the pipes and a discharge from the top, a speed of about 350 ft. per minute having proved most satisfactory from all points of view. The pipes should have an inclination of 45° from the horizontal, anything less being subject to settling.

In trials with this agitator in competition with simple mechanical agitators, it is claimed that a material increase of extraction was obtained.

Starting-Sheet Preparation

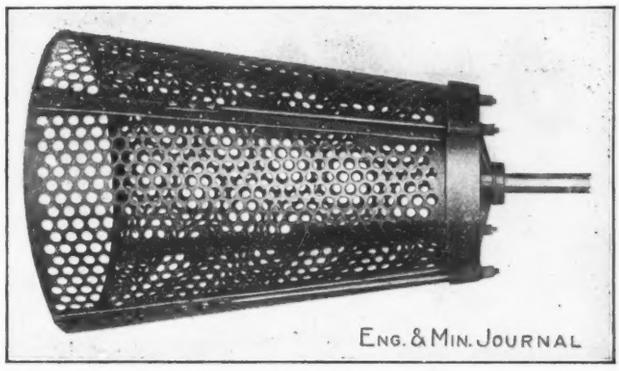
In making starting-sheets for electrolytic copper refining, the blank on which the light starting-sheet is deposited, and from which it is later stripped, should be placed in the electrolyte when current is passing. Neglect of this precaution may cause the deposited copper to "burn" on the blank, so that it is impossible to strip it off, and the blank is ruined.

The Dwight-Lloyd Process Combined with an Edwards Furnace is in use for roasting at the Chillagoe smelting plant in Queensland, Australia, according to the annual report of the Under Secretary for Mines for that state. The Edwards furnace is used to roast a portion of the ore, in order to obtain a blast-furnace feed sufficiently low in sulphur after treatment once over the Dwight-Lloyd machine.

MINING AND METALLURGICAL MACHINERY

Conical Screens

Conical screens, which in recent years have received extensive use in rock-crushing and gravel-washing plants, have not been widely adopted in mine work, though it would seem that these screens were well adapted to certain screening problems. The screen illustrated herewith represents the type recently installed by Natomas Consolidated in its new Fair Oaks washing plant, described in the JOURNAL of Sept. 13, 1913. These screens were



CONICAL GRAVEL SCREEN

made by the Meese & Gottfried Co., 55 Main St., San Francisco, and certain advantages are claimed over the ordinary conical screen.

The simplicity of the conical screen recommends it over that of the cylindrical screen in many installations, in which it shows economy in power consumption and in repairs by reason of having fewer wearing parts. The conical screen illustrated herewith is built upon a cast-iron head into which the driving shaft is pressed and keyed. The screen proper is made in four sections riveted together to form the frustum of a cone; this fits into a recess in the head casting and is held in place by four stay-rods. The screen is usually driven by a chain-and-sprocket drive keyed on the shaft at a suitable point between the bearings, one of which is placed close to the head casting. The shaft is, of course, longer than shown in the illustration; it is usually made long enough to suit the building framework, the additional shafting tending to balance the screen weight.

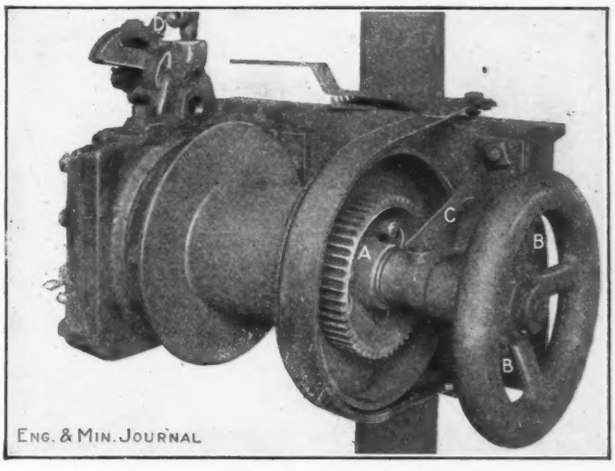
In older forms of conical screens it was necessary to remove the bearing caps, shaft and cast-iron head in order to change the screen. This has been overcome in later types and it will be seen from the accompanying illustration that the screen may now be readily removed or attached by means of the stay-bolts. Having stay-bolts attached at some distance from the head casting permits this screen to be readily attached, as the spring of the rods will compensate any trifling misfit that is annoying in some makes of screen where the stay-bolt end or attachment is close to the head casting with which it must register.

In gravel-washing plants, where the quantity of water used is immaterial, a nozzle sprays the oversize just before it leaves the screen to remove thoroughly all adhering dirt. The material to be screened is fed by a chute that delivers the product near the head of the screen. At the Natomas installation a steel lining disk, ½ in. thick by 48 in. in diameter, was placed in front of the cast-iron head to take any wear resulting from the rush or rapid flow of the rounded boulders. The chute which delivers the material to the head of the screen does not terminate in a square end, being cut off at an angle so as to distribute the feed in more than one spot. This obviates undue wear near the head of the screen; the greatest wear then usually occurs where the nozzle water strikes and churns the departing oversize. In some installations the latter is overcome or reduced by using a movable nozzle.

❖

Portable Column Hoist

A small, light hoist, suitable for mounting on a drill column and for use in stopes, winzes and raises, is shown in the accompanying illustration. It consists of a Dake



COMPACT HOIST FOR USE ON DRILL COLUMN

engine, to be described later, shown on the left end, a drum in the middle and a flywheel or handwheel on the right. The drum is loose on the shaft of the engine, which extends clear through the device. The gear *A* is fastened to the drum, and is driven by a pinion, not visible, under the housing *C*. This pinion has mounted on its shaft another gear *B*, which is driven in turn by a pinion on the main engine shaft. The flywheel or handwheel revolves with the engine shaft, but is mounted on a feather so as to have a motion of about ¾ in. along the shaft. By this means it serves to throw in or out of mesh the pinion on the shaft and thus clutch the drum in or out. It is held in either position by a spring ball catch. The shaft is really only a bearing for the drum, but when the drum is in clutch, it revolves in the same direction as the shaft, although at a lower speed. The engine is reversible and the drum can be driven in either

direction, but it is usually more convenient to lower with the drum out of clutch, using the brake alone.

The frame on which the hoist is mounted is a section of steel channel, the mounting being central so as to avoid any overhang or unbalanced condition. The drum is carried on bronze bushings; the main gear is of cut phosphor bronze, and both pinions are steel forgings, machine cut. The end of the shaft is also carried in a phosphor-bronze casting. The gears where necessary are provided with guards and there is a relative scarcity of cogs, levers, etc. The control of the device is extremely simple, being effected with a single lever *D*. The brake band is lined with Gandy belting. The engine is rated at 2 hp., operating on 80 to 100 lb. of air. The diameter of the drum is 6 in., and its length 7 in., being designed to hold 625 ft. of ¼-in. steel rope. The machine will hoist 500 lb. at the rate of 80 ft. per min.; it weighs 270 lb. and has a length over all of 22½ in. The clamp usually furnished is made for a 4½-in. column, but a 3½-in. column clamp can be had.

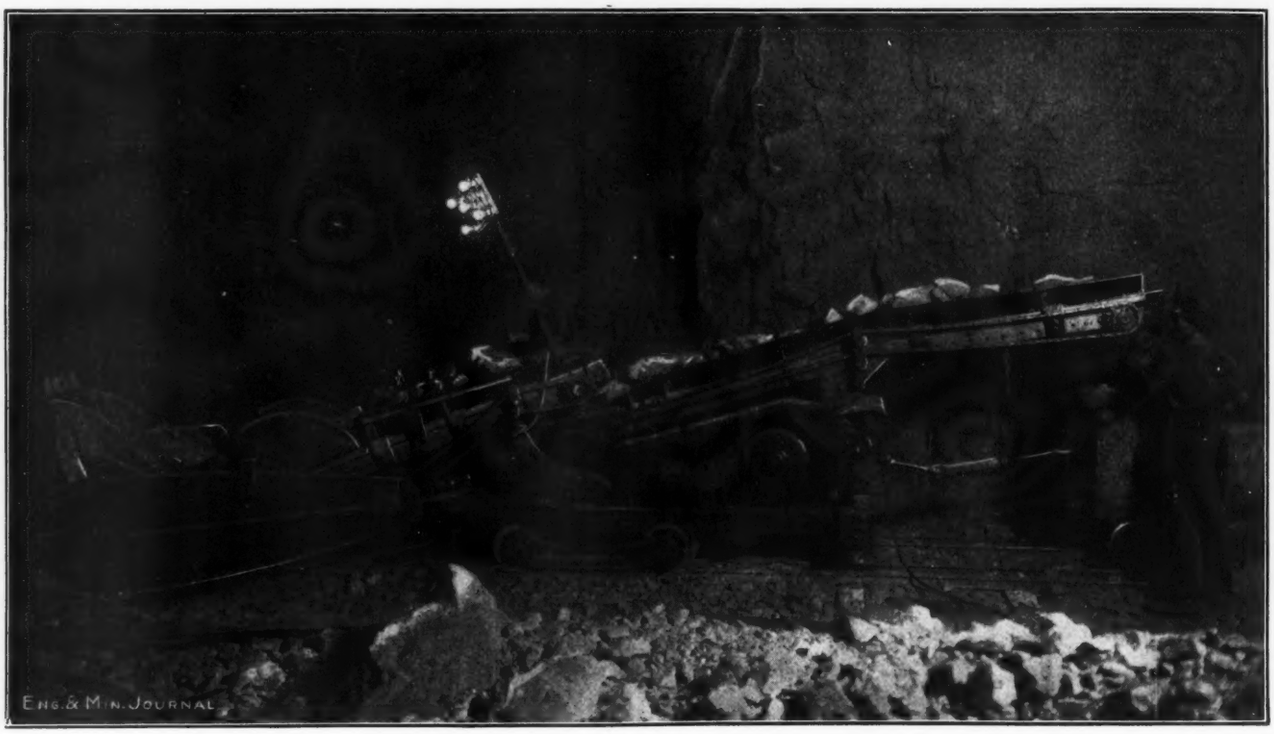
The Dake engine is a machine that has been on the market for at least 22 years. A description can be found in *Power* for December, 1891, page 11. It consists of the rather thin box shown in the drawing, in which a piston moves horizontally at right angles to the main shaft. This piston is a rectangular frame, containing another inner piston which has also a vertical motion. The crankpin of the shaft passes through the center of the inner piston and thus the combination horizontal and vertical motion of the two pistons is converted to the rotary motion of the shaft. The inner piston contains ports in its outer face, which register properly with ports in the cover of the box and serve to conduct the steam or air from the outside connection through four vertical and horizontal passages in the inner piston to the four faces of the pistons, these faces being long, narrow rectangles. The mechanism is thus evidently extremely simple.

The strength, compactness, simplicity and relative lightness of this hoist are to be highly commended. A device of this nature is of the greatest use in both raising and sinking and in stoping, not so much for handling ore or water, as for delivering such supplies as timber, steel, etc. The device is put on the market by the Hendrie & Bolthoff Mfg. & Supply Co., of Denver, Colo.

❋

Shoveling Machinery

A Myers-Whaley No. 4 shoveling machine was recently installed in the mines of the St. Louis Smelting & Refining Co., Flat River district, Mo. This machine loaded 449 tons in two shifts. It is now shut down, owing to the strike. A similar machine, installed by the Retsof Mining Co., of Retsof, N. Y., is successfully loading an average of 250 to 300 tons of rock salt per 9-hr. day.



SHOVELING MACHINE IN A FLAT RIVER, MO., MINE

❋

New Sullivan Drill Models

A recent bulletin of the Sullivan Machinery Co. describes the new line of "Hy-Speed" and "Liteweight" rock drills. The two types are alike in several features, having automatic lubricators, side-rod valve chests, equalizers for the side-rod springs and reversible shells. The "Liteweight" machine is especially designed for work where speed and convenience are paramount. It has a simple differential spool valve with interchangeable hardened-steel valve-chest bushings. The cylinder is steel lined. The "Hy-Speed" is a machine for hard rock, high air pressures and rough usage. It has a combination rocker and spool valve, so designed that the air for throwing the spool valve is used and not wasted by exhaustion to the atmosphere, as in the ordinary type of spool valve.

THE MINING INDEX

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

COPPER

23,189—ARSENICAL COPPER—A Method of Improving the Quality of Arsenical Copper. F. Johnson. (Engineering, Sept. 5, 1913; 2⅜ pp., illus.) Paper before Inst. of Metals, Aug. 29, 1913. 40c.

23,190—BUTTE—Mining the Wide Orebodies at Butte. Claude T. Rice. (Min. and Eng. Wld., Aug. 2, 9, 16 and 23, 1913; 14 pp., illus.) 80c.

23,191—COPPER DEOXIDATION by Means of Magnesium. Friedrich Hüser. (Met. and Chem. Eng., Sept., 1913; 2½ pp., illus.) Translated from Metall u. Erz, May 22, 1913. 40c.

23,192—CRUSHING—Winona Stamp Mill. R. B. Seeber. (Lake Superior Min. Inst., Aug., 1913; 19 pp., illus.)

23,193—HYDROMETALLURGY—Experiments on the Hydrometallurgical Treatment of Copper Slimes. W. R. Schoeller. (Journ. Soc. Chem. Ind., July 15, 1913; 1½ pp.)

23,194—LEACHING—Sulphuric-Acid Leaching. Editorial. (Min. and Sci. Press. Aug. 16, 1913; 1¼ pp.) 20c.

23,195—LEACHING of Copper Ores. John Rooke-Cowell. (Min. and Sci. Press, Aug. 23, 1913; 2 pp.) 20c.

23,196—MATTE SMELTING—Basisches Verschmelzen von Kupferstein. Haakon Styri. (Metall u. Erz, June 22, 1913; 3 pp.) Conclusion of article previously indexed. 40c.

23,197—MEXICO—The Magistral District, Jalisco, Mexico. Ezequiel Ordonez. (Eng. and Min. Journ., Sept. 13, 1913; 1¼ pp., illus.) 20c.

23,198—ORE BEDDING by the Tennessee Copper Co. H. F. Wierum. (Eng. and Min. Journ., Sept. 6, 1913; 2¾ pp.) 20c.

23,199—PYRITIC SMELTING—An Illustration of the Partial Pyrite Process. W. R. Schoeller. (Journ. Soc. Chem. Ind., July 31, 1913; 2 pp.)

23,200—REFINING—Notes on the Electrolytic Refining of Copper Precipitate Anodes. W. F. Burns. (Bull. A. I. M. E., July, 1913; 5 pp.) 40c.

23,201—RUSSIA—Das Kupferbergwerk zu Kedabeg, Gouvernement Elisabethpol, Kaukasus, Russland. Chaustoff. (Zeit. f. prakt. Geol., July, 1913; 5 pp., illus.) The copper mine at Kedabeg, administrative district of Yelizavetpol, Caucasus. 40c.

23,202—SMELTING GOLD- AND SILVER-BEARING COPPER ORE—Die Verschmelzung der gold- und silberhaltigen Kupfererze auf den Blagodatny Werken. M. F. Ortin. (Metall u. Erz, June 22 and July 22, 1913; 28 pp., illus.)

23,203—SMELTING WORKS—Improvements at the Consolidated Co.'s Smelting Works at Trail, B. C. E. Jacobs. (Can. Min. Journ., Aug. 15, 1913; 1½ pp.) 20c.

GOLD AND SILVER—GEOLOGY

23,204—ONTARIO—Kirkland Lake Gold Deposits. Reginald E. Hore. (Can. Min. Journ., July 15, 1913; 7½ pp., illus.) 20c.

23,205—PHILIPPINES—Alteration and Enrichment in Calcite-Quartz-Manganese Gold Deposits in the Philippine Islands. F. T. Eddingfield. (Philippine Journ. of Sci., Apr., 1913; 10 pp.)

23,206—PORCUPINE—Gold Deposits of Porcupine District, Ont. Reginald E. Hore. (Econ. Geol., Aug., 1913; 7 pp.) 60c.

23,207—WESTERN AUSTRALIA—Geology of the Kalgoorlie Goldfield. Malcom MacLaren and J. Allan Thomson. (Min. and Sci. Press, July 12, 19, Aug. 2, 9 and Sept. 6, 1913; 22 pp., illus.) $1.

GOLD—PLACER MINING

23,208—ALSAKA—The Fineness of Gold in the Fairbanks District, Alaska. Philip S. Smith. (Econ. Geol., Aug., 1913; 6 pp.) 60c.

23,209—COLOMBIA—Placer Mining on the Cauca River in Colombia, S. A., Wm. F. Ward. (Mex. Min. Journ., Aug., 1913; 3¼ pp., illus.) 20c.

23,210—NEVADA—Ingenious Placer Operations near Manhattan, Nev. (Min. and Eng. Wld., Aug. 2, 1913; ¾ p.) 20c.

23,211—NEW ZEALAND—The Black Sand Beaches of the South Island of New Zealand. G. W. Eaton. (Aust. Min. Stand., July 3, 1913; 1 p.) 40c.

GOLD AND SILVER—CYANIDING

23,212—AGITATION—The Symmes Agitator. Whitman Symmes. (Min. and Sci. Press, July 19, 1913; 2¼ pp., illus.) 20c.

23,213—BLACK HILLS—Cyanide Practice in the Black Hills, South Dakota—III. H. C. Parmelee. (Met. and Chem. Eng., Sept., 1913; 3 pp., illus.) 40c.

23,214—BRITISH COLUMBIA—The Motherlode Mill, Salmo, B. C. C. Earl Rodgers. (Eng. and Min. Journ., Sept. 20, 1913; 3¼ pp., illus.) 20c.

23,215—CALCULATION OF EXTRACTION in Cyanidation. Herbert A. Megraw. (Eng. and Min. Journ., Sept. 6, 1913; 3 pp.) 20c.

23,216—COLORADO—The Argo Cyanide Mill, Idaho Springs, Colo. Stephen L. Goodale. (Eng. and Min. Journ., Aug. 30, 1913; 4¼ pp., illus.) 20c.

23,217—DIRECT CYANIDATION—The Simplification of Gold-Ore Treatment by Direct Cyanidation. A. W. Allen. (Min. and Sci. Press, Aug. 16, 1913; 2 pp.) 20c.

23,218—ELECTROLYSIS of Aqueous Solutions of the Simple Alkaline Cyanides. G. Howell Clevenger and M. L. Hall. (Advance Copy, Am. Electrochem. Soc., Sept., 1913; 19 pp.)

23,219—FILTRATION—Vacuum Filtration at the Victoria Mill of the Waihi Gold Mining Co., Ltd., New Zealand. William Macdonald. (Journ. Chem., Met. & Min. Soc. of So. Afr., May, 1913; 12½ pp., illus.) 60c.

23,220—LIME—The Use of Lime in Cyanide Work. A. M. Merton. (Min. Sci., Sept., 1913; 4 pp., illus.) 20c.

23,221—SLIME—Evolution in Methods of Handling Slime—VI, Rhodesia. H. N. Spicer. (Met. and Chem. Eng., Sept., 1913; 3½ pp., illus.) 40c.

23,222—SLIME AGITATION by the Wright-Jaentsch Centrifugal Aerator. H. B. Wright. (Journ. W. Aust. Chamber of Mines, June 30, 1913; 2 pp., illus.)

23,223—WEST END MILL—Operation of the West End Mill, Tonopah. Jay A. Carpenter. (Min. and Sci. Press, Aug. 2, 1913; 2 pp.) Abstract from annual report. 20c.

GOLD AND SILVER—DESCRIPTIVE

23,224—COLOMBIA—Mining Progress in Colombia. Silas H. Wright. (Mex. Min. Journ., July, 1913; 1 p.) 20c.

23,225—HONDURAS—The Olancho Country. A. D. Akin. (Min. and Sci. Press, July 12, 1913; 3½ pp., illus.) 20c.

GOLD AND SILVER—GENERAL

23,226—ALASKA—Precious and Semiprecious Metals in Alaska in 1912. Mine Production. Alfred H. Brooks. (Advance Chapter from Mineral Resources of the U. S., 1912; 16 pp.)

23,227—ANALYTICAL METHODS—The Determination of Gold in the Presence of Iridium and Allied Metals in Materials such as Black Sand. James Gray and Chris Toombs. (Journ. Chem., Met. and Min. Soc. of So. Afr., July, 1913; 6½ pp.) 60c.

23,228—COBALT—Draining Kerr Lake; a Novel Departure in Metal Mining. Ben Hughes. (Min. and Eng. Wld., Aug. 16, 1913; ¾ p., illus.) 20c.

23,229—COSTS—Working Costs at the Standard Consolidated. E. H. Nutter. (Min. and Sci. Press, Aug. 23, 1913; 1¼ pp.) 20c.

23,230—CRIPPLE CREEK—Leasing and Low-Grade Milling at Cripple Creek. Stephen L. Goodale. (Min. and Sci. Press, Aug. 23, 1913; 4 pp., illus.) 20c.

23,231—EQUIPMENT—New Equipment, Cam and Motor Mine, Rhodesia. (So. Afr. Eng., July, 1913; 1⅓ pp., illus.) 40c.

23,232—MEXICO—La Mazata Mine, Jalisco, Mexico. Thomas C. Myers. (Eng. and Min. Journ., Sept. 6, 1913; ½ p.) 20c.

23,233—ORE TREATMENT—Cam and Motor Metallurgy. Gordon F. Dickson. (Min. Mag., Aug., 1913; 4¾ pp., illus.) Method of treating a Rhodesian gold ore containing arsenic and antimony. 40c.

23,234—RAND CONDITIONS and Future Outlook. H. S. Denny. (Min. and Sci. Press, Sept. 6, 1913; 2¾ pp.) 20c.

23,235—RAND MINING POLICIES. (Eng. and Min. Journ., Aug. 30, 1913; 1¼ pp.) 20c.

23,236—SOUTH DAKOTA—Homestake and Wasp. Jesse Simmons. (Min. Mag., July, 1913; 2½ pp., illus.) Notes on remarkable achievements of two low-grade mines. 40c.

23,237—TEMPERATURES at the Morro Velho Mine in Brazil. (Min. and Sci. Press, Sept. 6, 1913; 1½ pp., illus.) 20c.

23,238—UTAH—Mining Operations in the Alta District. Will C. Higgins. (Salt Lake Min. Rev., July 30, 1913; 8⅓ pp., illus.) 20c.

23,239—WESTERN AUSTRALIA—Reports on Victorious and Gimblet Mines at Ora Banda. A. Montgomery. (Appendix to State Min. Engr.'s Report, 1912; Perth, W. A., 1913; 13 pp., illus.)

IRON-ORE DEPOSITS, MINING, ETC.

23,240—IRON-ORE RESOURCES—Le Minerai de Fer dans le Monde. (Ann. des Mines de Belgique, Vol. XVIII, Part 3, 1913; 19 pp., illus.)

23,241—MINING METHODS—Some Close Work in Iron Mining. (Eng. and Min. Journ., Sept. 13, 1913; 1½ pp.) From a paper by D. E. Woodbridge before Lake Superior Min. Inst., being notes on work in Alabama, Maryland and New York. 20c.

23,242—NEW YORK—A Methuselah among American Mines. L. O. Kellogg. (Eng. and Min. Journ., Sept. 6, 1913; 2¾ pp., illus.) Description of the Sterling iron mine in Orange County, N. Y. 20c.

23,243—PRODUCTION—The Production of Iron Ore, Pig Iron and Steel in 1912. Ernest F. Burchard. (Advance Chapter from Mineral Resources of the U. S., 1912; 58 pp.)

23,244—SAFETY in the Mines of the Lake Superior Iron Ranges. Edwin Higgins. (Lake Superior Min. Inst., Aug., 1913; 18 pp.)

IRON AND STEEL METALLURGY

23,245—BRIQUETTING—Anreichern, Brikettieren und Agglomerieren von Eisenerzen und Gichtstaub. (Stahl u. Eisen, July 24, Aug. 7 and 14, 1913; 23 pp.) Discussion of paper previously indexed. List of patents is appended: $1.

23,246—CARBON DETERMINATION—Method for the Rapid Determination of Total Carbon in Iron, Steel, Cast-Iron and in the Iron Alloys. H. De Nolly. (Chem. Engr., July, 1913; 3 pp., illus.) 40c.

23,247—CAST STEEL—Shock Tests of Cast Steel. John H. Hall. (Bull. A. I. M. E., July, 1913; 10 pp., illus.) 40c.

23,248—COKE-OVEN GAS—The Decomposition of Coke-Oven Gas and Its Employment in the Unheated Condition in Steel-making. O. Simmersbach. (Iron and Coal Tr. Rev., July 18, 1913; ¼ pp., illus.) From "Stahl u. Eisen." 40c.

23,249—CORROSION—Electrolytic Methods for Preventing Corrosion. W. W. Haldane Gee. (Trans. Faraday Soc., July, 1913; 10 pp., illus.)

23,250—CORROSION of Iron and Steel. William H. Walker. (Journ. Soc. Chem. Ind., June 16, 1913; 1 p.)

23,251—COSTS—Tabular Costing in Iron and Steel Works. A. Waink. (Iron and Coal Tr. Rev., July 18, 1913; 1⅝ pp.) From Stahl u. Eisen. 40c.

23,252—ELECTRIC SMELTING—Possible Applications of the Electric Furnace to Western Metallurgy. Dorsey A. Lyon and Robert M. Keeney. (Advance Copy, Am. Electrochem. Soc., September, 1913; 29 pp.)

23,253—FOUNDRY—Eine selbsttätige Aufbereitanlage für Modelisand und Masse. (Zeit. d. Vereines Deutsch. Ing., July 5, 1913; 2½ pp., illus.) An automatic dressing plant for molding sand and ganister.

23,254—FOUNDRY SANDS—Etude Résumée sur les Sables de Fonderie et Leur Traitement. A. L. Curtis. (Rev. de Met., Aug., 1913; 13 pp.)

23,255—FURNACE CHARGING—Umbau einer Kupolofenbeschickungsanlage. (Stahl u. Eisen, Aug. 28, 1913; 1½ pp., illus.) Rebuilding of a charging plant for cupola furnaces. 40c.

23,256—GALVANIZING—A Well-Arranged Plant for Galvanizing Sheets. (Iron Tr. Rev., July 24, 1913; 2 pp., illus.) New works of Brier Hill Steel Co., Niles, Ohio. 20c.

23,257—HARDENING—Electric Furnace for Hardening Tools. (Iron Tr. Rev., July 17, 1913; 1⅓ pp., illus.) 20c.

23,258—HEAT TREATMENT—Influence of Mass in Heat-Treatment of Steel. K. W. Zimmerschield. (Iron Tr. Rev., July 10, 1913; 1½ pp.) Paper before Am. Soc. for Testing Materials. 20c.

23,259—LABOR—Wie alt wird der deutsche Eisenarbeiter. J. Reichert. (Stahl u. Eisen, July 10, 1913; 6 pp.) What age does the German iron worker attain? 40c.

23,260—NICKEL-CHROME STEELS—Sur deux Aciers Nickel-Chrome. A. Portevin. (Rev. de Met., July, 1913; 2½ pp., illus.)

23,261—PHOSPHORUS—Determination of Phosphorus in Steels Containing Vanadium. J. R. Cain and F. H. Rucker. (Journ. Ind. and Eng. Chem., Aug., 1913; 3 pp.) 60c.

23,262—PRODUCTION—The Production of Iron Ore, Pig Iron and Steel in 1912. Ernest F. Burchard. (Advance Chapter from Mineral Resources of the U. S., 1912; 58 pp.)

23,263—PRODUCTION AND PRICES—Course of Iron Output and Prices in Century. E. C. Eckel. (Iron Tr. Rev., Aug. 21, 1913; 2⅝ pp., illus.) 20c.

23,264—REHEATING—Ueber den heutigen Stand der Tiefofenfrage. F. Schruff. (Stahl u. Eisen July 3 and 10, 1913; 9 pp., illus.) On the present status of the reheating-furnace question. 60c

23,265—REHEATING—Wärmöfen mit flammenloser Gasfeuerung. Canaris. (Feuerungstechnik, Aug. 1, 1913; 1 p., illus.) Reheating furnaces with flameless gas firing. 40c.

23,266—ROLLING-MILL INDUSTRY, The. F. H. Kindl. (Iron Tr. Rev., Aug. 28, 1913; 7 pp., illus.) Continuation of article previously indexed. 20c.

23,267—STEEL WORKS—The Fried. Krupp Works, Friedrich-Alfred Hütte, Rheinhausen. (Engineering, Sept. 5, 1913; 2½ pp., illus.)

23,268—TITANIUM DETERMINATION—Colorimetric Method for Titanium in Iron and Steel. C. R. McCabe. (Journ. Ind. and Eng. Chem., Sept., 1913; 1¾ pp.) 60c.

23,269—TOOL STEELS—Die Fortschritte deutscher Stahlwerke bei der Herstellung hochlegierter Schnellarbeitsstähle. (Stahl. u. Eisen. Aug. 7, 1913; 8 pp.) Continued discussion of paper by Prof. Schlesinger. 40c.

23,270—VANADIUM IN STEEL by the Hydrogen Peroxide Color Method. C. R. McCabe. (Journ. Ind. and Eng. Chem., Sept., 1913; 1¼ pp.) 60c.

LEAD AND ZINC

23,271—ANALYSIS—Combined Method of Analysis for Constituents of Zinc Ores. Frank A. Bird. (Min. and Sci. Press, July 5, 1913; 1 p.) 20c.

23,272—ELECTRIC POWER for Missouri-Kansas Zinc Mines. Warren Aikens. (Min. and Eng. Wld., Aug. 16, 1913; 2 pp., illus.) 20c.

23,273—ELECTRIC ZINC FURNACE, The. Peter E. Peterson. (Advance copy, Am. Electrochem. Soc., Sept., 1913; 23 pp., illus.)

23,274—FLOTATION PROCESS—Broken Hill Treatment Methods. J. Malcolm Newman. (Aust. Min. Stand., June 26, 1913; 1 p.) 40c.

23,275—FLUORINE DETERMINATION—Die Bestimmung des Fluors in Zinkerzen. Leop. Schneider. (Oest. Zeit. f. B. u. H., July 5, 1913; 2 pp.) 40c.

23,276—MISSOURI—Conditions in the Joplin District. Temple Chapman. (Eng. and Min. Journ., Aug. 30, 1913; 1¼ pp.) 20c.

23,277—ORE TREATMENT—Further Notes on Broken Hill Treatment Methods. J. Malcolm Newman. (Aust. Min. Stand., July 17, 1913; 1 p.)

23,278—REFINING—Lead Refining Plant at South Chicago. H. B. Pulsifer. (Min. and Eng. Wld., July 26 and Aug. 2, 1913; 7¼ pp., illus.) 40c.

23,279—SPAIN—The Lead Industry in Spain—I. (Min. Journ., July 26, 1913; 1 p.)

23,280—WISCONSIN—Churn Drilling in Southwestern Wisconsin. W. F. Boericke. (Eng. and Min. Journ., Aug. 30, 1913; 2½ pp., illus.) 20c.

OTHER METALS

23,281—ALUMINUM—Alloying Aluminum with the Rarer Metals. C. H. Ivinson. (Foundry, Aug., 1913; 1¾ pp., illus.) Paper before Brit. F'dymen's Assn. 20c.

23,282—ANTIMONY, ARSENIC, ETC.—The Production of Antimony, Arsenic, Bismuth and Selenium in 1912. Frank L. Hess. (Advance Chapter from Mineral Resources of the U. S., 1912; 13 pp.)

23,283—MANGANESE—The Production of Manganese and Manganiferous Ores in 1912. D. F. Hewett. (Advance Chapter from Mineral Resources of the U. S., 1912; 21 pp.)

23,284—MANGANESE—Some Manganese and Copper Developments in the Olympic Mountains, Washington. (Pac. Min. Journ., July, 1913; 2½ pp., illus.) 20c.

23,285—NICKEL—Sorting, Roasting and Smelting Nickel-Copper Ore, Canadian Copper Co. (Can. Min. Journ., Aug. 1, 1913; 6 pp., illus.) 20c.

23,286—PLATINUM—Osmium-Platinum—A New Alloy. F. Zimmerman. (Advance Copy, Am. Electrochem. Soc., Sept., 1913; 1½ pp.)

23,287—RADIUM—The Distribution of Radio-Active Substances in the Universe. W. W. Strong. (Radium, July, 1913; 4 pp.) 20c.

23,288—TIN—Around the Tasmanian Mines—The Northeastern Tin Fields. Peter G. Tait. (Min. and Eng. Rev., July 5, 1913; ¾ p.) 40c.

23,289—TIN—Historical Note on Tin Smelting. (Eng. and Min. Journ., Sept. 13, 1913; 1 p.) Foot-note from Hoover's translation of "Agricola." 20c.

23,290—TIN—Mining in Katanga, Congo Belge. R. H. Gwyn-Williams. (Min. Journ., Aug. 23, 1913; 2 pp.) 40c.

23,291—TIN AND TUNGSTEN—Treatment of Tinstone and Wolframite. Otto Falkenberg. (Min. Journ., Aug. 23, 1½ pp., illus.) 40c.

23,292—TUNGSTEN—On Some Occurrences of Wolframite Lodes and Deposits in the Tavoy District of Lower Burma. A. W. G. Bleeck. (Rec., Geol. Surv. of India, May, 1913; 26 pp.)

23,293—TUNGSTEN—Ueber das Wolfram und die Geschichte seiner Duktilisierung. Hüller. (Zeit. f. angew. Chem., July 11 and 18, 1913; 3½ pp.) On tungsten and how it came to be made ductile. 40c.

NONMETALLIC MINERALS

23,294—BARYTES—The Production of Barytes in 1912 with a note on Strontium Ore and Salts. James M. Hill. (Advance Chapter from Mineral Resources of the U. S., 1912; 8 pp.)

23,295—BAUXITE—The Production of Bauxite and Aluminum in 1912. W. C. Phalen. (Advance Chapter from Mineral Resources of the U. S., 1912; 16 pp., illus.)

23,296—BORAX—The Production of Borax in 1912. Charles G. Yale and Hoyt S. Gale. (Advance Chapter from Mineral Resources of the U. S., 1912; 10 pp., illus.)

23,297—COLEMANITE—The Origin of Colemanite Deposits. Hoyt S. Gale. (U. S. Geol. Surv., Professional Paper 85-A, 1913; 9 pp.) Paper based on a short personal study of the borate deposits in Ventura County, Calif.

23,298—DIAMONDS—The South Western Diamond Fields, Transvaal. (So. Afr. Min. Journ., July 26, 1913; 2¼ pp., illus.) 40c.

23,299—EMERALD FIELDS of Colombia. F. P. Gamba. (Min. and Sci. Press, Aug. 30, 1913; 1 p., illus.) 20c.

23,300—FULLER'S EARTH—The Production of Fuller's Earth in 1912. Jefferson Middleton. (Advance Chapter from Mineral Resources of the U. S., 1912; 8 pp.)

23,301—GARNET DEPOSITS of Warren County, New York. William J. Miller. (N. Y. State Museum, Bull. 164, Mar. 1, 1913; 8 pp.)

23,302—GEMS—Precious Stones in Ceylon. C. K. Moser. (Daily Consular and Trade Reports, Aug. 12, 1913; 3½ pp.)

23,303—GYPSUM INDUSTRY in 1912. Ralph W. Stone. (Advance Chapter from Mineral Resources of U. S., 1912; 13 pp.)

23,304—LIME—The Production of Lime in 1912. Ralph W. Stone. (Advance Chapter from Mineral Resources of the U. S., 1912; 20 pp.)

23,305—MAGNESITE—The Production of Magnesite in 1912. Charles G. Yale and Hoyt S. Gale. (Advance Chapter from Mineral Resources of the U. S., 1912; 9 pp.)

23,306—NITRATE FIELDS of Chile. Walter S. Tower. (Pop. Sci. Monthly, Sept., 1913; 22 pp., illus.) 40c.

23,307—POTASH—Die Versorgung der Vereinigten Staaten von Nordamerika mit Kali. Bentz. (Glückauf, Aug. 16, 1913; 4½ pp.) Supplying the U. S. with potash. 40c.

23,308—POTASH—Progress in Potash Prospecting in Railroad Valley, Nevada. E. E. Free. (Min. and Sci. Press, Aug. 2, 1913; 3 pp., illus.) 20c.

23,309—POTASH — Ueber die Anwendung elektrischer Schwingungen (drahtloser Telegraphie) zur Erforschung des Erdinnern, besonders im Kalibergbau. Leimbach. (Kali, Sept. 1, 1913; 9 pp.) On the application of electric vibrations (wireless telegraphy) in the exploration of the interior of the earth, particularly in potash mining. 40c.

23,310—SAND AND GRAVEL—The Production of Sand and Gravel in 1912. Ralph W. Stone. (Advance Chapter from Mineral Resources of the U. S., 1912; 18 pp.)

23,311—STRONTIUM—Celestite Deposits in California and Arizona. W. C. Phalen. (U. S. Geol. Surv., Bull. 540-T, 1913; 15 pp., illus.)

23,312—TALC AND SOAPSTONE—The Production of Talc and Soapstone in 1912. J. S. Diller. (Advance Chapter from Mineral Resources of the U. S., 1912; 32 pp., illus.)

PETROLEUM AND NATURAL GAS

23,313—CALIFORNIA—The Prevention of Waste of Oil and Gas from Flowing Wells in California. Ralph Arnold and V. R. Garfias. (U. S. Bureau of Mines, Tech. Paper 42, 1913; 15 pp., illus.)

23,314—CHEMISTRY AND TECHNOLOGY—Chemie und Technologie des Erdöls im Jahre 1912. Gurwitsch. (Zeit. f. angew. Chem., June 27, 1913; 8¾ pp.) 60c.

23,315—TESTING—Methods and Apparatus Used in Petroleum Testing—Part II, Viscosity. W. F. Higgins. (Journ. Soc. Chem. Ind., June 16, 1913; 5½ pp., illus.)

ECONOMIC GEOLOGY—GENERAL

23,316—AFRICA—Ueberblick über die nutzbaren Lagerstätten Katangas. Stutzer. (Metall u. Erz, Aug. 30, 1913; 7 pp., illus.) A review of the useful mineral deposits of Katanga. 40c.

23,317—CHIHUAHUA—Apuntes sobre Algunos Minerales del Estado de Chihuahua, Trinidad Paredes. (Bol. Soc. Geol. Mex., 1912; Vol. 8, Part 1, 20 pp.)

23,318 — CHIHUAHUA — Estudio de Algunos Minerales Raros del Estado de Chihuahua. Ernesto Wittich. (Bol. Soc. Geol. Mex., Vol. 8, Part 1, 1912; 4½ pp.

23,319—CHILE—Geological Exploration of Punta Arenas, Chile. Johannes Felsch. (Mex. Min. Journ., Aug., 1913; 1⅝ pp.) 20c.

23,320—INDIA—General Report of the Geological Survey of India for the year 1912. H. H. Hayden. (Rec. Geol. Surv. of India, May, 1913; 40 pp.)

23,321—MEXICO—Algunos Datos Geologicos sobre la Region Minera de Yesca (Tepic) de Los Alerededores de La Mine "Nueva Buenavista y Anexas. Paul Waitz and L. Hijar y Haro. (Bol. Soc. Geol. Mex., Vol. 8, Part 1, 1912; 25¼ pp.)

23,322—ORE DEPOSITS—The Relation of Pyrrhotite to Chalcopyrite and Other Sulphides. Arthur P. Thompson. (School of Mines Quart., July, 1913; 16 pp., illus.) 60c.

23,323—PHILIPPINE—Ore Deposits of the Philippine Islands. F. T. Eddingfield. (Philippine Journ. of Sci., Apr., 1913; 24 pp., illus.)

23,324—REPORTS—Field and Office Methods in the Preparation of Geologic Reports. (Econ. Geol., Aug., 1913; 20 pp., illus.) A series of articles, including "A Modification of the Walcott Method of Measuring Stratigraphic Sections," by E. Blackwelder; "Tables Showing Apparent Dip of Structure Planes in any Vertical Section," by H. Mosier; and others. 60c.

23,325—ROCKS—The Chemical Composition of the Alkaline Rocks and Its Significance as to Their Origin. C. H. Smyth, Jr. (Am. Journ. of Sci., July, 1913; 14 pp.) 40c.

23,325a—UTAH—Reconnaissance in the Southern Wasatch Mountains, Utah. G. F. Loughlin. (Journ. Geol., July-Aug., 1913; 17 pp., illus.) 60c.

MINING—GENERAL

23,326—ACCIDENT—Unfall in Brandwettern auf den Möllerschächten der Königlichen Berginspection 2 zu Gladbeck am 21 November, 1912. Richstaetter. (Preuss. Zeit. f. B. H. u. S., Part II, 1913; 6¼ pp., illus.) Accident in fiery smoke at the Moeller shafts, district of Gladbeck on Nov. 21, 1912.

23,327 — ACCIDENTS — Die tödlichen Verunglückungen beim Bergwerksbetrieb im Oberbergamtsbezirk Dortmund im Jahre 1912. (Glückauf, July 12, 1913; 3 pp.) Fatal accidents in mining operations in the Dortmund district in 1912. 40c.

23,328—ACCIDENTS—Report on the Mining Accidents in Ontario for January, February and March, 1912. E. T. Corkill. (Ont. Bureau of Mines, Bull. 10, 1912; 11 pp.)

23,329—ACCIDENTS—Report of Committee on the Practice for the Prevention of Accidents. (Advance copy, Lake Superior Min. Inst., Aug., 1913; 5 pp.)

23,330—AERIAL ROPEWAY at the Governor Norman Mine. (Queensland Govt. Min. Journ., July 15, 1913; 1½ pp., illus.) 60c.

23,331—AFRICA—Mining in Katanga. R. H. Gwyn-Williams. (Min. Journ., Aug. 30, 1913; 2 pp., illus.) 40c.

23,331a—AIR—Etude sur l'Aérage des Mines. J. Bouvat-Martin. (Bull. Soc. de l'Ind. Minérale, July and Aug., 1913; 45 pp.)

23,332—BLASTING—Le Bourrage Extérieur en Poussières Incombustibles. Victor Watteyne and Emmanuel Lemaire. (Ann. des Mines de Belgique, Vol. XVIII, Part 3, 1913; 36 pp., illus.—translated in Coll. Guardian Aug. 15, 1913; 2⅝ pp.)

23,333—BRITISH COLUMBIA—Preliminary Review and Estimate of Mineral Production, 1912. Wm. Fleet Robertson. (B. C. Bureau of Mines, Bull. 1, 1913; 29 pp.)

23,334—CABLES—Factors of Safety in Vulcanized Bitumen Mine Cables. C. J. Beaver. (Iron and Coal Tr. Rev., July 18, 1913; ½ p., illus.) 40c.

23,335—COSTS—Mine Cost Keeping. C. M. Eye. (Min. and Sci. Press, Aug. 16, 1913; 1½ pp.) 20c.

23,336—DETONATORS—Investigations of Detonators and Electric Detonators. Clarence Hall and Spencer P. Howell. (U. S. Bureau of Mines, Bull. 59, 1913; 73 pp., illus.)

23,337—DIAMOND DRILLING at the Poderosa Mine. C. L. Severy. (Min. and Sci. Press, Aug. 30, 1913; 1¾ pp., illus.) 20c.

23,338—EXPLOSIVES—The Testing of Explosives for Inclusion in the Permitted List. (Colliery Guardian, Aug. 15, 1913; 1¾ pp., illus.) 40c.

23,339—FIREDAMP—Recent Experience on the Ignition of Firedamp by Electric-Lamp Filaments. Jean Meunier. (Iron and Coal Tr. Rev., July 4, 1913; 1¼ pp., illus.) 40c.

23,340—FRANCE—Die französische Bergwerks-industrie im Jahre 1911. (Glückauf, Aug. 2, 1913; 5¼ pp.) The French mining industry in 1911. 40c.

23,341 — HOISTING — Die Gefäss-Schachtförderung (Skipförderung) und der deutsche Bergbau. Herbst. (Glückauf, Aug. 2 and 9, 1913; 12¾ pp., illus.) Hoisting in skips and German mining. 60c.

23,342—HOISTING ROPES—Le Coefficient de Sécurité des Cables d'Extraction. A. D. F. Baumann. (Ann. des Mines de Belgique, Vol. XVIII, Part 3, 1913; 5 pp.)

23,343—MINE VALUATION—Mine Managers as Valuers. Morton Webber. (Min. Mag., Aug., 1912; 5¾ pp., illus.) 40c.

23,344—MINING METHOD—Factors Affecting Choice of Mining Method. E. M. Weston. (Eng. and Min. Journ., Sept. 20, 1913; 2¼ pp.) 20c.

23,345—POWER—A Modern Substation in the Coeur d'Alene Mining District. John B. Fisken. (Proc. A. I. E. E., Sept., 1913; 18 pp., illus.)

23,346—PROP—Mehrteiliger hölzerner, nach dem Verfahren von Heidcamp hergestellter Grubenstempel. (Glückauf, Aug. 23, 1913; 1 p., illus.) A sectional mine prop designed by Heidcamp. 40c.

23,347—PUMPING at the Comstock Mines. A. M. Walsh. (Min. and Sci. Press, Aug. 23, 1913; 1½ pp., illus.) 20c.

23,348—RESCUE WORK—Prüfungsvorrichtungen für Sauerstoff-Atmungsgeräte. Forstmann. (Glückauf, Aug. 2, 1913; 2¾ pp., illus.) Testing devices for oxygen-inhaling apparatus. 40c.

23,349—SAFETY in the Mines of the Lake Superior Iron Ranges. Edwin Higgins. (Advance Copy, Lake Superior Min. Inst., Aug., 1913; 18 pp.)

23,350—SANITATION for Mine Locations. W. H. Moulton. (Advance Copy, Lake Superior Min. Inst., Aug., 1913; 5 pp.)

23,351—SHAFT SINKING—Das Schachtabteufen nach dem Verfahren von Kind-Chaudron im Oberbergamtsbezirk Clausthal. Albrecht. (Preuss. Zeit. f. B., H. u. S., Part II, 1913; 32 pp., illus.) Shaft sinking by the Kind-Chaudron method in the Clausthal mining district.

23,352—SHAFT-SINKING METHODS at Butte. H. S. Munroe. (Eng. and Min. Journ., Aug. 30, 1913; 1¼ pp.) 20c.

23,353—SHAFT STATION—Concrete Shaft Station, Wolverine Mine. Claude T. Rice. (Eng. and Min. Journ., Aug. 30, 1913, 1½ pp., illus.) 20c.

23,354—SHAFT TIMBERING in Swelling Ground. W. H. Storms. (Eng. and Min. Journ., Sept. 13, 1913; 1 p.; illus.) 20c.

23,355—SILESIA—Uebersicht über die Entwicklung des schlesischen Berg- und Hüttenwesens. Dünkelberg. (Glückauf, Aug. 30, 1913; 5 pp.) A review of the evolution of the Silesian mining and metallurgical industries. 40c.

23,356—SOUTH DAKOTA AND WYOMING—Precious and Semiprecious Metals in South Dakota and Wyoming in 1912. Mine Production. Charles W. Henderson. (Advance Chapter from Mineral Resources of the U. S., 1912; 20 pp.)

23,357—TUNNELING—Concreting a Tunnel by Compressed Air. A. C. Everham. (Eng. News, July 31, 1913; 1¾ pp., illus.) 20c.

23,358—WAGES—Nachweisung der in den Hauptbergbaubezirken Preussens im 1 Vierteljahr 1913 verdienten Bergarbeiterlöhne. (Preuss. Zeit. f. B., H. u. S., part II, 1913; 3 pp.) Tables of wages earned by the mine workers in the principal mining districts of Prussia in the first quarter of 1913.

MINING LAW

23,359—APEX LAW—The Origin of the Present Apex Law. J. A. Simmons. (Min. and Eng. Wld., Aug. 23, 1913; 2 pp., illus.) 20c.

23,360—EXTRALATERAL RIGHTS to Quartz Veins. (Eng. and Min. Journ., Sept. 20, 1913; 7 pp., illus.) An article by John B. Clayberg in "Calif. Law Rev.," May, 1913. 20c.

23,361—WORKMEN'S COMPENSATION PROBLEMS. H. W. Gartell. (Min. and Sci. Press, July 19, 1913; 1 p.)

ORE DRESSING—GENERAL

23,362—CANVAS PLANT of the Federal Lead Co. Claude T. Rice. (Eng. and Min. Journ., Sept. 13, 1913; 1¾ pp., illus.) 20c.

23,363—ECONOMICS of Milling. Gelasio Caetani. (Min. Mag., Aug., 1913; 6¾ pp., illus.) Second of two lectures delivered at Harvard University. 40c.

23,364—ELECTROSTATIC ORE DRESSING, Progress in. Frank S. Macgregor. (Advance Copy, Am. Electrochem. Soc., Sept., 1913; 6 pp.)

23,365—MILLING PLANTS—Under-Estimating the Cost of Milling Plants. A. Sydney Additon. (Min. and Sci. Press, Aug. 23, 1913; 3¾ pp.) Conclusion of article previously indexed. 20c.

23,366—ROCK CRUSHING—No. 2 Crushing Plant of Natomas Consolidated. Richard H. Vail. (Eng. and Min. Journ., Sept. 13, 1913; 5½ pp., illus.) 20c.

METALLURGY—GENERAL

23,367—ALLOYS—Les Alliages d'Aluminium et de Zinc. Rosenhain and Archbutt. (Rev. de Met., July, 1913; 32 pp., illus.)

23,368—CARBORUNDUM REFRACTORIES. F. J. Tone. (Met. and Chem. Eng., Sept., 1913; 1½ pp.) 40c.

23,369—CORROSION—Second Report to the Corrosion Committee of the Institute of Metals. Guy D. Bengough. (Engineering, Aug. 29 and Sept. 5, 1913; 10 pp., illus.) 80c.

23,370—FIREBRICKS—The Deterioration of Firebricks During Service. Gilbert Rigg. (Journ. Ind. and Eng. Chem., July, 1913; 5 pp., illus.) 60c.

23,371—FLAMELESS COMBUSTION—Die Flammenlose Oberflächenverbrennung. Krull. (Zeit. f. angew. Chem., July, 1913; 4 pp., illus.) The flameless surface combustion. 40c.

23,372—HEAT FLOW—Some Aspects of Heat Flow. Edwin F. Northrup. (Advance Copy, Am. Electrochem. Soc., Sept., 1913; 22 pp.)

23,373—SMELTER SMOKE—Electrical Precipitation of Suspended Particles. Linn Bradley. (Proc. Engrs. Soc. W. Penn., Apr., 1913, 23 pp.) 60c.

FUELS

23,374—CLASSIFICATION of Coals. J. M. Gordon. (Can. Min. Journ., Aug. 15, 1913; 3½ pp.) 20c.

23,375—EFFICIENCY VALUATION of Fuels. W. F. Elwood. (Colliery Engr., Aug., 1913; 2⅓ pp.) 20c.

23,376—GERMANY—Die Stein- und Braunkohlen Vorräte des deutschen Reiches. Böker. (Glückauf, July 5 and 12, 1913; 29¾ pp., illus., also, abridged, in Stahl u. Eisen, July 10 and 17, 1913; 14¼ pp.) The coal and lignite reserves of the German Empire. 80c.

23,377—OIL FUEL—Purchasers' Tests of Crude Fuel Oil. W. B. Perkins. (Power, Aug. 19, 1913; 1¼ pp., illus.) 20c.

23,378—PEAT—Ueber Torfverkokung. Wihtol. (Feuerungstechnik, Sept. 1, 1913; 2½ pp.) On coking peat. 40c.

MINING AND METALLURGICAL MACHINERY

23,379—CHURN DRILLS—Itemized Equipment for Churn Drill Operated by Miami Copper Co. H. P. Bowen. (Eng. and Min. Journ., Sept. 6, 1913; 1¾ pp., illus.) 20c.

23,380—CONVEYORS—Mechanical Handling of Materials. Reginald Trautschold. (Can. Engr., Aug. 21, 1913; 5 pp., illus.) Classification of apparatus; flight conveyors; first article of series. 20c.

23,381—DRILLS—Economy of Hammer Drills. George E. Addy. (Mex. Min. Journ., Aug., 1913; ½ p., illus.) 20c.

23,382—ELECTRIC FURNACES, Their Design, Characteristics and Commercial Application. Woolsey McA. Johnson and George N. Sieger. (Met. and Chem. Eng., Sept., 1913; 2½ pp.) First of a series of articles. 40c.

23,383—ELECTRIC SWITCHES—Safety Electric Switches for Mines. H. H. Clark. (Tech. Paper 44, U. S. Bureau of Mines, 1913; 8 pp.)

23,384—FIREDAMP INDICATORS—Die verschiedenen Baurarten von Wetteranzeigern. Forstmann. (Glückauf, June 28 and July 5, 1913; 15 pp., illus.) The different patterns of firedamp indicators. 60c.

23,385—GAS ENGINES—A New Method of Cooling Gas Engines. Bertram Hopkinson. (Iron and Coal Tr. Rev., Aug. 1, 1913; 2 pp., illus.) Paper before Brit. Instn. Mechan. Engrs. 40c.

23,386—GAS PRODUCERS—Effect of Variable Load on Gas Producers. Reginald Trautschold. (Power, July 29, 1913.) 20c.

23,387—GASOLINE ENGINES—Tests on Small Gasoline Engines. F. M. and E. A. White. (Power, Aug. 26, 1913; 2½ pp., illus.) 20c.

23,388—GASOLINE MOTOR—Mechanical Details of a Gasoline Motor. R. O. Hodges. (Coal Age, Aug. 2, 1913; 1½ pp.) Third installment of article before W. Va. Coal Min. Inst., June, 1913. 20c.

23,389—HOISTS—Efficiencies of Two Rand Electric Hoists. J. N. Bulkley. (Eng. and Min. Journ., Aug. 2, 1913; 1 p., illus.) 20c.

23,390—LAMP—A Home-Made Acetylene Lamp. A. Livingstone Oke. (Eng. and Min. Journ., Sept. 6, 1913; ¾ p., illus.) 20c.

23,391—LOCOMOTIVES—Etude comparative entre la Locomotive à benzine et la Locomotive à Air Comprimé. Leopold Dehez. (Ann. des Mines de Belgique, Vol. XVIII, Part 3, 1913; 5 pp.)

23,392—LUBRICATION with Oils, and with Colloidal Graphite. Charles F. Mabery. (Journ. Ind. and Eng. Chem., Sept., 1913; 6 pp., illus.) 60c.

23,393—MOTOR TRUCK in Contracting and Construction Work. Rollin W. Hutchinson, Jr. (Eng. Mag., Sept., 1913; 24 pp., illus.) First of a series of five articles. 40c.

23,394—MOTOR TRUCKS for Mines. O. H. Sonne. (Eng. and Min. Journ., Sept. 6, 1913; ¾ p.) Experience with a motor truck and trailer in Nevada. 20c.

23,395—MOTORS—The Application and Care of Induction Motors. C. A. Tupper. (Iron Tr. Rev., Aug. 21, 1913; 2 pp.) 20c.

23,396—OIL ENGINES—Gross dieselmotoren, ihre Brennstoffe, Konstruktion und Anwendungsgebiete. (Zeit. d. Vereines Deutsch. Ing., July 19, 1913; 4½ pp., illus.) Large-sized Diesel motors, their fuel, construction and scope of application.

23,397—POWER PLANT at the Associated Kalgoorlie. M. W. von Bernewitz. (Min. and Sci. Press, Aug. 30, 1913; 1½ pp., illus.) 20c.

23,398—RESCUE APPARATUS—Method of Testing Draeger Oxygen Helmets at the Copper Queen Mine. C. A. Mitke. (Bull. A. I. M. E., July, 1913; 4 pp., illus.) 40c.

23,399—ROCK-DRILL LUBRICATION. (Eng. and Min. Journ., Sept. 13, 1913; 1¼ pp.) Information compiled from manufacturers and users of rock drills. 20c.

23,400—SAFETY LAMPS—The Lighting Efficiency of Safety Lamps. T. A. Saint. (Trans. No. Eng. Inst. Min. and Mech. Engrs., May, 1913; 10 pp., illus.)

23,401—SIGNALS—Installation dans les Puits de Mines de Signaux pouvant être Manoeuvrés des Cages en Mouvement. J. Kersten. (Ann. des Mines de Belgique, Vol. XVIII, Part 3, 1913; 31 pp., illus.—abstracted in Coll. Guardian, Aug. 22, 1913; 2⅓ pp.)

23,402—SMELTING FURNACE—A Five-Ton Smelting Furnace that Smelts. Royal P. Jarvis. (Eng. and Min. Journ., Aug. 30, 1913; ¾ p.) Discussion on article by C. H. Mace, previously indexed. 20c.

23,403—STEAM TURBINES—Prüfung und Beurteilung von Dampfturbinenölen. Schwarz and Marcusson. (Zeit. f. angew. Chem., June 27, 1913; 4 pp.) Testing and valuing steam-turbine oils. 40c.

SAMPLING AND ASSAYING

23,404—AMMONIA AND NITROGEN—Ueber Ammoniak- und Stickstoffbestimmung. Knublauch. (Zeit. f. angew. Chem., July 25, 1913; 6½ pp., illus.) On the determination of ammonia and nitrogen. 40c.

23,405—AMMONIA CITRATE SOLUTION—A Simple Method of Preparing Neutral Ammonia Citrate Solution. A. J. Patten and W. C. Marti. (Journ. Ind. and Eng. Chem., July, 1913; 1 p.) 60c.

23,406—ANALYSIS—Fortschritte auf dem Gebiete der Metallanalyse im Jahre 1912. Döring. (Chem.-Ztg., Sept. 1, 1913; 2½ pp.) Progress in metal analysis in 1912. 40c.

23,407—COPPER-TIN ALLOYS—The Analysis of Copper-Tin Alloys. W. Gemmell. (Journ. Soc. Chem. Ind., June 16, 1913; 3¾ pp.)

23,408—CRUCIBLES—Magnesite Crucibles. Donald M. Liddell. (Eng. and Min. Journ., Sept. 13, 1913; ¾ p.) 20c.

23,409—ELECTRODES—Ueber die Verwendung von Tantalelektroden zur Elektroanalytischen Bestimmung von Kupfer u. Zink. Wegelin. (Chem.-Ztg., Aug. 19, 1913; 3 pp.) On the application of tantalum electrodes to the electro-analytic determination of copper and zinc. 40c.

23,410—IGNITION DEVICE—Convenient Device for Analytical Ignitions. Edward D. Campbell. (Journ. Ind. and Eng. Chem., Aug., 1913; 1¼ pp. illus.) 60c.

23,411 — NITROGEN — Stickstoffbestimmungsapparat. Wentzki. (Zeit. f. angew. Chem., July 4, 1913; ½ p., illus.) Apparatus for the determination of nitrogen. 40c.

INDUSTRIAL CHEMISTRY

23,412—AMMONIUM SULPHATE — Etude des Nouveaux Systèmes de Condensation Goudronneuse du Gaz de Houille et de Production du Sulfate d'Ammoniaque. Charles Berthelot. (Rev. de Met., Aug., 1913; 32 pp., illus.)

23,413—ATMOSPHERIC NITROGEN — Aluminum Carbo-Nitride. Experimental Evidence of Dissociation at Temperatures above 1450 deg. C. S. Peacock. (Am. Fertilizer, Aug. 9, 1913; 4¼ pp., illus.) 20c.

23,414—ACID PHOSPHATE—The Manufacture of Acid Phosphate. J. S. Brogdon. (Am. Fertilizer, Sept. 6, 1913; 4 pp.) 20c.

23,415—COKE BYPRODUCTS—Recovery of Byproducts in the Modern Byproduct Coke-Oven Plant. C. A. Meissner. (Met. and Chem. Eng., Aug., 1913; 4 pp., illus.) 40c.

23,416—COKE-OVEN GAS—La Récoperation de l'Ammoniaque du Gaz de Distillation de la Houille dans les Cokeries. M. Desmarets. (Rev. de Met., Aug., 1913; 27 pp., illus.)

23,417—TIMBER PRESERVATION—The Determination of Zinc in Treated Ties. Francis C. Frary and M. Gordon Mastin. (Journ. Ind. and Eng. Chem., Sept., 1913; 1½ pp.) 60c.

23,418—WASTE WATERS—Die Bedeutung kollioder Tone für die Entfärbung und Reinigung industrieller Awässer. Rohland. (Chem.-Ztg., July 10, 1913; ½ p.) The importance of colloid clays for decolorizing and purifying industrial waste waters. 40c.

MATERIALS OF CONSTRUCTION

23,419—CEMENT—Fineness of Cement and Rate of Hydration. Henry S. Spackman. (Can. Engr., July 24, 1913; 1¾ pp.) From a paper before the Am. Soc. for Testing Materials. 20c.

23,421—CONCRETE—The Effect of Saturation on the Strength of Concrete. J. L. Van Ornum. (Proc. A. S. C. E., Aug., 1913; 8 pp., illus.)

23,422—PORTLAND CEMENT—Ein neues Varfahren zur Untersuchung und zum Studium des Portlandzements. Grünwald. (Chem.-Ztg., July 24, 1913; 1½ pp.) A new method for the examination and study of Portland cement. 40c.

23,423 — PORTLAND - CEMENT CLINKER, The Constitution of. Edward D. Campbell. (Journ. Ind. and Eng. Chem., Aug., 1913; 3½ pp., illus.) 60c.

MISCELLANEOUS

23,424—CONSTRUCTIÓN CAMP at Arrowrock Dam. Alfred B. Mayhew. (Eng. Rec., Aug. 2, 1913; 3 pp., illus.) 20c.

23,425—EXCAVATION for the Arrowrock Dam, Idaho. Charles H. Paul. (Eng. News, July 17, 1913; 7½ pp., illus.) 20c.

23,426—FILING TRACINGS—A Simple System for Filing and Handling Tracings and Prints. Fred Buch. (Eng. Mag., July, 1913; 16 pp., illus.) 40c.

23,427—HYDRO-ELECTRIC PLANTS—A Review of Recent Progress in the Engineering of Hydro-Electric Power Plants and Transmission Systems. David B. Rushmore. (Gen. Elec. Rev., June, 1913; 6 pp., illus.) 40c.

23,428—HYDROELECTRIC POWER—The Generation and Transmission of Hydroelectric Power. E. A. Lof. (Eng. Mag., July, 1913; 6 pp.) Fifth article of series on commercial opportunities for the utilization of water power. 40c.

23,429—MEXICO—The Situation in Mexico. (Eng. and Min. Journ., July 26, 1913; 1 p., illus.) Map showing how things stand in Mexico at present time. 20c.

23,430—NIGERIA—Journeys in Nigeria. J. B. Richardson. (Min. Mag., May, 1913; 9 pp. illus.) A mining engineer's experiences. 40c.

23,431—PHILIPPINES as a Business Proposition. Lewis R. Freeman. (Eng. Mag., Aug., 1913; 15 pp., illus.) 40c.

Leaching of Copper Ores

SPECIAL CORRESPONDENCE

After a lapse of a number of years the leaching of copper ores is becoming a subject of increasing interest, and extensive experiments are being carried on by various companies, especially in the Southwest, where several properties have developed important tonnages of low-grade oxidized ores not amenable to concentration or to smelting. Experiments, however, are not being confined to the treatment of oxidized copper ores. Some typical concentrating ores, for which a few years ago the usual wet-concentration plant would have been erected, are now being subjected to tests with a view to leaching them. In the North, the Anaconda company is experimenting with a similar product, the sand tailing from its concentrating mill.

Leaching is by no means a new process in copper metallurgy. It has been applied in Europe for many years; in the Western Hemisphere there have been isolated operations, most of which were of short duration. The leaching plant of the Arizona Copper Co., however, is a noteworthy exception, having been in continuous operation for nearly 20 years. Exhaustion of the richer orebodies has directed attention to the treatment of certain classes of ore that had previously been neglected and leaching is again to the fore. While in most cases the details of processes have not been completed it will be of interest to enumerate the general trend of the experiments of some of the important companies. It should be borne in mind that the outlines given are in many cases merely tentative and do not necessarily represent the final methods that will be adopted by these companies.

For the Calumet & Arizona interests Stuart Croasdale is experimenting on a leaching process for treating the oxidized ore of the isolated Ajo property in southwestern Arizona. It is expected that leaching will be done with sulphuric acid made by roasting Bisbee sulphides. Precipitation will be accomplished by iron, which will probably be obtained by reducing the calcined Bisbee ore with coke or coal dust; it is understood that the company has also considered as commercially possible the use of pig iron, notwithstanding the fact that the Ajo property is distant 40 miles from the railroad.

Phelps, Dodge & Co. control several properties in Arizona, having important tonnages of low-grade ore for which leaching will possibly be adopted. In the Copper Queen mine, at Bisbee, it has been developing, during the last year, a body of disseminated ore in the porphyry-limestone breccia. The latter is the immediate subject of leaching experiments which have been conducted by G. D. Van Arsdale, at Douglas. A Wedge furnace is used to produce a sulphate roast with the idea of obtaining a large portion of the copper in water-soluble form; dilute sulphuric acid resulting from the electrolytic deposition of the copper will be used to complete the leaching. Electrolytic precipitation is being experimented with, SO_2 gas being introduced into the electrolyzing tanks as a depolarizer.

At the New Keystone property in the Miami district, experiments have been begun for the treatment of its ore by R. C. Canby, and it is quite possible that some form of leaching, or leaching in combination with some other process, will be adopted. Experiments have only recently been begun, however, and have not progressed to a point yet where it is possible to outline the general trend of the probable process.

The Arizona Copper Co., at Clifton, treats the tailing from its oxide-concentrating mill. Leaching is accomplished here with sulphuric acid, made by roasting sulphide ore, the fines being roasted in Herreshoff furnaces, and the lump ore in regular pyrite burners. Much of the copper is in carbonate form, resulting in a neutral precipitating liquor, from which the copper is precipitated by wrought scrap. The leaching solutions vary in strength from 10 to 17% H_2SO_4 and the iron consumption in the precipitating tanks is about 1.08 lb. per lb. of copper.

In Montana several small leaching plants have been built in Butte, during the last few years, but probably the most important work is the experimenting of Thomson and Laist at the Anaconda works. Here it is proposed to leach the sand tailing from the concentrator carrying about 0.65% copper. This product will be roasted in McDougal furnaces with enough salt to roast the copper to an oxide and the silver to chloride; leaching will be accomplished with dilute H_2SO_4 made from the gases of the McDougal roasting the rich concentrates. Precipitation will probably be done with H_2S obtained from an iron matte; it is understood that scrap iron is also being considered as a precipitant. Following tests in a 10-ton plant, a trial plant of 80 to 90 tons capacity is now being built for the purpose of trying the process on a larger scale.

In South America, the Chile Exploration Co. is undertaking an important leaching operation at Chuquicamata, where it has a large copper deposit of peculiar character, the principal mineral being brochantite ($4\,CuO.SO_3.3\,H_2O$). This ore is to be coarse crushed, leached with dilute H_2SO_4 and precipitated electrically. The consumption of acid is expected to be small, as part of the copper is present as sulphate. The ore contains some nitrates, however, and some free nitric acid will be produced. It is understood that the metallurgical difficulties have been overcome in the preliminary experimental work. Power for this operation will be produced at the seacoast and transmitted 41 miles to Chuquicamata.

⁂

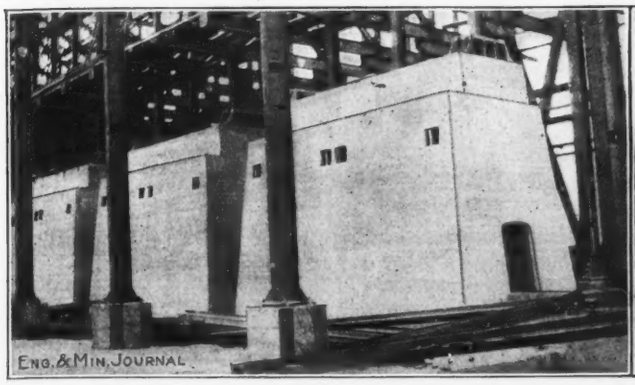
Queensland Mineral Production in 1912

The value of the mineral production of Queensland for 1912, according to the annual report of the Minister for Mines, was £4,175,355, including coal. The increase over the preceding year was £514,292, due to the stimulating influence of high prices for metals, together with a noticeable advance in the yield of copper, tin and other minerals. The value of the gold yield for the year was £1,477,979, less than that of copper, and a decrease from 1911. Mount Morgan continues to be the leading mine. Of the copper mines, the Cloncurry is the foremost producer, making a contribution of 10,435 tons. The total copper production was 23,120 tons. While prospecting for tin was active, there were no new discoveries of importance made during the year. The tin-ore production was 3230 tons, valued at £364,503. The silver production was 569,181 oz. Lead, tungsten, manganese, bismuth, molybdenite, opal and other gems were also produced.

PHOTOGRAPHS FROM THE FIELD

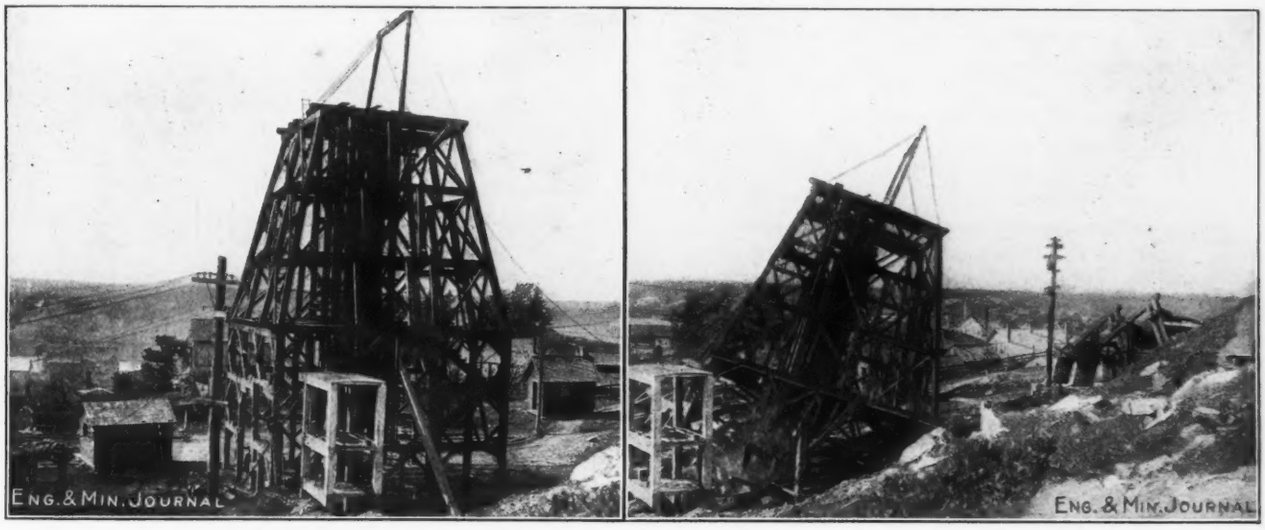
NEW KLEINFONTEIN CYANIDE PLANT, BENONI, TRANSVAAL
It was here that the strike was started early in July

THE PENNINGTON OPENPIT OF TOD, STAMBAUGH & CO., THE ONLY
This mine is one mile west of Ironton. The overburden is



VAN RYN DEEP MORTAR BLOCKS, IN FEBRUARY

CASON MINE AND WORKS ON EAST RAND



DISMANTLING REPUBLIC NO. 9 SHAFT HEADFRAME, AT REPUBLIC, MICH.
The posts were cut through before the structure was pulled over. Both photograps were taken from the same position.

OPENPIT MINE NOW IN OPERATION ON THE CUYUNA RANGE IN MINNESOTA
ideal, being entirely free from stratified material.

Titaniferous Iron Ore Investigation

Dr. Joseph A. Holmes, Director of the Bureau of Mines, in the preface to Bull. 64, "The Titaniferous Iron Ores in the United States," by Joseph T. Singewald, Jr., says:

One of the problems that confronts American ironmasters is the efficient reduction of magnetite containing high percentages of titanium. From time to time the discovery of enormous bodies of workable titaniferous ore has been reported, and the available literature dealing with the geologic occurrence and the economic value of the titaniferous magnetite in the United States contains a mass of information that in part is based on incomplete observation and even on hearsay.

Although the supplies of nontitaniferous iron ore that are available in the United States are still to be measured by millions of tons, yet the approaching exhaustion of many high-grade deposits, the general acceptance by blast furnaces of ore lower in iron than those utilized ten years ago, and the probability of even lower-grade ores being used in increasing quantities indicate that some large deposits of ore would be contributing to the needs of the country were it not for their titanium content. In an attempt to ascertain just what the economic possibilities of the larger deposits of titaniferous iron ore may be, the Bureau of Mines took up the study of the possible utilization of these ores through some concentrating process. The conduct of this investigation was assigned to J. T. Singewald, Jr., and the results are presented in this report. Mr. Singewald was directed to pay especial attention to the possibility of utilizing titaniferous ores at a profit with present methods and devices and under existing conditions. He was authorized to study in detail the physical structure and chemical composition of the ores, as bearing on the problem of utilization, but not to undertake any detailed investigation of the origin and geologic distribution of the deposits.

It is to be regretted that the results of Mr. Singewald's careful study of the ores are chiefly negative. Some deposits of titaniferous iron ore are clearly not so extensive nor so high in iron as they were reported to be. Moreover, examination of many samples by metallographic methods has demonstrated that, although a large part of the titanium in these ores is in the form of ilmenite, much of this ilmenite is far more intimately associated with the magnetite than has generally been supposed. Part of the magnetite and ilmenite occurs in such large and distinct aggregates that their separation by a magnetic concentration after fine crushing is practicable, but in by far the larger number of samples examined and in practically all the orebodies that are known to be large enough, and rich enough in iron to be of much importance, most of the ilmenite occurs as such fine intergrowths in the mass of magnetite that a complete separation of the two minerals by any process based on difference of physical properties still seems impractical. Crushing even to 200 mesh would not insure a clean separation of the two minerals. Consequently, the problem of utilizing titaniferous magnetites involves the application of chemical rather than physical methods. In short, the problem is not one of eliminating the titanium by milling, but of reducing the ores directly by some smelting process.

Iron ores containing over 1% of titanium are troublesome to smelt in the blast furnace. Though Rossi and other investigators have demonstrated the possibility of eliminating titanium through the formation of relatively fluid slags consisting of complex titanosilicates, there seems to be no inclination on the part of the ironmasters to adopt furnace practice to these conditions. However, as Mr. Singewald points out, it is practicable to use in blast-furnace mixtures small proportions of the concentrates from a magnetic separation of the titaniferous ores with little change in present methods and without danger of choking a furnace. The use of electricity in smelting offers other possibilities. The reduction of titaniferous ores in electrically heated furnaces and the production of iron-titanium alloys by a direct process are problems of such importance that the Bureau of Mines, in connection with its investigations of the treatment of ores and of more efficient methods of smelting, is undertaking experiments with these ores.

❋

The Metal Tariff

WASHINGTON CORRESPONDENCE

The Conference Committee on the Tariff on Sept. 29 reported to the House of Representatives, on Schedule C. Some of the main items are as given below. They are not likely to be further changed.

104. Chrome or chromium metal, ferrochrome or ferrochromium, ferromolybdenum, ferrophosphorus, ferrotitanium, ferrotungsten, ferrovanadium, molybdenum, titanium, tantalum, tungsten or wolfram metal, and ferrosilicon, and other alloys used in the manufacture of steel, not specially provided for in this section, 15% ad valorem.

105. Muck bars, bar iron, square iron, rolled or hammered, round iron, in coils or rods, bars or shapes of rolled or hammered iron not specially provided for in this section, 5% ad valorem.

106. Beams, girders, joists, angles, channels, cartruck channels, TT, columns and posts or parts or sections of columns and posts, deck and bulb beams, sashes, frames, and building forms, together with all other structural shapes of iron or steel, whether plain, punched, or fitted for use or whether assembled or manufactured, 10% ad valorem.

107. Boiler or other plate iron or steel, and strips of iron or steel, not specially provided for in this section; sheets of iron or steel, common or black, of whatever dimensions, whether plain, corrugated, or crimped, including crucible plate steel and saw plates cut or sheared to shape or otherwise, or unsheared, and skelp iron or steel, whether sheared or rolled in grooves, or otherwise, 12% ad valorem.

145. Aluminum, aluminum scrap, and alloys of any kind in which aluminum is the component material of chief value, in crude form, 2c. per lb.; aluminum, in plates, sheets, bars, strips and rods, 3½c. per lb.; barium, calcium, magnesium, sodium and potassium, and alloys of which said metals are the component material of chief value, 25% ad valorem.

146. Antimony, as regulus or metal, and matte containing antimony but not containing more than 10% of lead, 10% ad valorem; antimony oxide, salts, and compounds of, 25% ad valorem.

147. Argentine, albata, or german silver, unmanufactured, 15% ad valorem.

148. Bronze powder, brocades, flitters, and metallics, bronze or Dutch-metal or aluminum, in leaf, 25% ad valorem.

149. Copper, in rolled plates, called braziers' copper, sheets, rods, strips, pipes, and copper bottoms, sheathing or yellow metal and composition metal, including brass, copper, and nickel alloys of which copper is the component material of chief value, and not composed wholly or in part of iron ungalvanized, 5% ad valorem.

150. Gold leaf, 35% ad valorem.

151. Silver leaf, 30% ad valorem.

152. Tinsel wire, lame or lahn, made wholly or in chief value of gold, silver, or other metal, 10% ad valorem; bullions and metal threads, made wholly or in chief value of tinsel wire, lame or lahn, 25% ad valorem; fabrics, ribbons, beltings, toys, or other articles, made wholly or in chief value of tinsel wire, lame or lahn, or of tinsel wire, lame or

lahn and india rubber, bullions or metal threads, not specially provided for in this section, 40% ad valorem.

154. Lead-bearing ores of all kinds, containing more than 3% of lead, ¾c. per lb. on the lead contained therein: Provided, That on all importations of lead-bearing ores the duties shall be estimated at the port of entry, and a bond given in double the amount of such estimated duties for the transportation of the ores by common carriers bonded for the transportation of appraised or unappraised merchandise to properly equipped sampling or smelting establishments, whether designated as bonded warehouses or otherwise. On the arrival of the ores at such establishments they shall be sampled according to commercial methods under the supervision of Government officers, who shall be stationed at such establishments, and who shall submit the samples thus obtained to a Government assayer, designated by the Secretary of the Treasury, who shall make a proper assay of the sample and report the result to the proper customs officers, and the import entries shall be liquidated thereon, except in case of ores that shall be removed to a bonded warehouse to be refined for exportation as provided by law. And the Secretary of the Treasury is authorized to make all necessary regulations to enforce the provisions of this paragraph.

155. Lead dross, lead bullion or base bullion, lead in pigs and bars, lead in any form not specially provided for in this section, old refuse lead run into blocks and bars, and old scrap lead fit only to be remanufactured; lead in sheets, pipe, shot, glaziers' lead, and lead wire; all the foregoing, 25% ad valorem on the lead contained therein.

156. Metallic mineral substances in a crude state, and metals unwrought, whether capable of being wrought or not, not specially provided for in this section, 10% ad valorem; monazite sand and thorite; thorium, oxide of and salts of; gas, kerosene or alcohol mantles treated with chemicals or metallic oxides, 25% ad valorem; and gas-mantle scrap consisting in chief value of metallic oxides, 10% ad valorem.

157. Nickel, nickel oxide, alloy of any kind in which nickel is a component material of chief value, in pigs, ingots, bars, rods, or plates, 10% ad valorem; sheets or strips, 20% ad valorem.

161. Quicksilver, 10% ad valorem. The flasks, bottles, or other vessels in which quicksilver is imported shall be subject to the same rate of duty as they would be subjected to if imported empty.

162. Type metal and types, 15% ad valorem.

164. Zinc-bearing ores of all kinds, including calamine, 10% ad valorem upon the zinc contained therein: Provided, That on all importations of zinc-bearing ores the duties shall be estimated at the port of entry, and a bond given in double the amount of such estimated duties for the transportation of the ores by common carriers bonded for the transportation of appraised or unappraised merchandise to properly equipped sampling or smelting establishments, whether designated as bonded warehouses or otherwise. On the arrival of the ores at such establishments they shall be sampled according to commercial methods under the supervision of Government officers, who shall be stationed at such establishments, and who shall submit the samples thus obtained to a Government assayer, designated by the Secretary of the Treasury, who shall make a proper assay of the sample and report the result to the proper customs officers, and the import entries shall be liquidated thereon, except in case of ores that shall be removed to a bonded warehouse to be refined for exportation as provided by law. And the Secretary of the Treasury is authorized to make all necessary regulations to enforce the provisions of this paragraph.

165. Zinc in blocks, pigs, or sheets, and zinc dust; and old and worn-out zinc fit only to be remanufactured, (10) 15% ad valorem.

169. Articles or wares not specially provided for in this section; if composed wholly or in part of platinum, gold, or silver, and articles or wares plated with gold or silver, and whether partly or wholly manufactured, 50% ad valorem; if composed wholly or in chief value of iron, steel, lead, copper, brass, nickel, pewter, zinc, aluminum, or other metal, but not plated with gold or silver, and whether partly or wholly manufactured, 20% ad valorem.

❖

The Rough Creek District in California, this summer became the scene of a mining excitement which drew many prospectors and miners from Bodie, Masonic and Bridgeport. This old Mono County mining district was prospected in the early '80s and much work was done without commensurate return. It is reported that lately the main vein of the district which attains a width of several hundred feet has been uncovered, and that ore assaying as high as $17 per ton has been disclosed. Gold, silver and cinnabar were reported to have been found in various places along the creek. The prospectors and miners are not likely to continue exploration and development unless something of permanency and value is found.

Tax on Mining Income

WASHINGTON CORRESPONDENCE

Probably the most important mining suit, with regard to the corporation tax, brought before the Supreme Court of the United States for a long time has been filed and briefs have been put in during the past week. The case comes on a certificate from the United States Circuit Court of Appeals for the eighth circuit. The statement of the case is as follows:

Stratton's Independence, Ltd., is a corporation organized under the laws of the Kingdom of Great Britain and Ireland, carrying on mining operations in the State of Colorado, and is the plaintiff in error in Case No. 3862 in the United States Circuit Court of Appeals, Eighth Circuit, from which court the questions herein are certified.

During all the time in question in said action this company has owned certain mining premises purchased by it for $335,000 on July 29, 1909, and its sole activities have been the mining and marketing of the ores therefrom. During the years 1909 and 1910 it mined ores therefrom and sold the metal contents for a price in excess of the cost of mining, extracting, and marketing the same. By stipulation in the case it is agreed that such excess represents the true value of the ores so extracted, when in place. The collector of internal revenue for the District of Colorado assessed, levied and collected from the company a tax of 1% upon such excess, without deduction, other than the arbitrary deduction of $5000 per annum, claiming that such excess represented the net income of the company, and that a tax was properly collectable thereon, under the provisions of section 38 of the act of Congress entitled "An act to provide revenue, equalize duties and encourage the industries of the United States, and for other purposes," approved Aug. 5, 1909 (36 Stat. at Large, p. 11).

The company laid proper foundation for the recovery of the tax, by the necessary appeals to the Commissioner of Internal Revenue, and by payment under protest.

Three questions are certified to this court, as follows:

I. Does Sec. 38 of the Act of Congress entitled "An act to provide revenue, equalize duties, and encourage the industries of the United States, and for other purposes" apply to mining corporations? II. Are the proceeds of ores mined by a corporation from its own premises income within the meaning of the aforementioned act of Congress? III. If the proceeds from ore sales are to be treated as income, is such a corporation entitled to deduct the value of such ore in place and before it is mined as depreciation within the meaning of Section 38 of said act of Congress?

In presenting the argument for these points the contestants make the following points:

First—Mining corporations are not included in general classifications of corporations, as such classifications are used in legislation. The fact that the natural enjoyment of a mining estate results in the waste of the estate, and the fact that the true value thereof is impossible of determination, have caused such properties to be considered as anomalous, and to be so treated in the general incorporation laws of the mining states, and the decisions of the courts relating thereto, in the laws establishing systems of taxation in the mining states, and by the decisions under the Federal Bankruptcy Act of 1898.

Second—In the administration of Section 38, the Commissioner of Internal Revenue at first recognized

that the provisions thereof do not fit the conditions of a mining corporation, and attempted to make over the act of Congress by administrative legislation. (T. D. 1742, December 15, 1911.)

Third—Mining corporations are not engaged in carrying on business within the meaning of the act.

Fourth—The application of the act to mining corporations results in a tax upon the capital itself, while, as applied to corporations having an income, as distinguished from capital, it does not result in a tax upon capital. This inequality of operation is inherently unjust. Laying aside all questions of constitutional limitations, the act should not be so construed as to accomplish this unjust result, if there be a fair and reasonable construction to be given the act which will avoid it.

Fifth—The proceeds of mining operations do not represent values created by, or incident to, the business activities of such a corporation, and cannot be a true measure of a tax leveled at such corporate business activities.

Sixth—The measurement of the tax by the excess of the receipts for ore marketed over the cost of mining, extracting and marketing the same is equivalent to a tax upon the usual and ordinary incidents of ownership of such property—such a direct tax as is prohibited by the Constitution—and, further, is such a tax as Congress, by the provisions for the deduction of depreciation provided in the act, expressly intended to avoid.

Seventh—The proceeds of mining operations result from a conversion of the capital represented by real estate into capital represented by cash, are in no true sense "income." The act cannot apply to a corporation which has no "income."

Eighth—The act ought not to be construed to include mining corporations unless it clearly appears that Congress intended to include them. It is an established canon of construction in this court that "duties are never imposed on the citizen upon vague or doubtful interpretations."

Ninth—The fact that mining corporations come within the letter of the act, if true, does not conclude the argument; for, if mining corporations be not within the spirit of the act, it is not applicable to them.

On the second part the main argument is that:

Under the second subdivision of the argument on the first question, we refer to the attitude at first taken by the Commissioner of Internal Revenue, as disclosed by Treasury Decision No. 1742. In that decision, the Commissioner recognized that the tax ought not to be paid on all the net proceeds derived from the sale of ores mined. He expressly excluded what he called the "unearned increment" from the computation of "gross income." But this policy was only applied to mines purchased prior to Jan. 1, 1909. As to properties acquired after that date, no exclusion of "unearned increment" was permitted by the decision. As above stated, the Commissioner does not now follow that decision. Proceeds of ores mined and sold are now classed as "gross income." It is noticeable that in that decision, in two sections—Section 100 and 105—he speaks of the proceeds as arising from the sale of, disposal of, or profits arising from, "capital assets." It must be the fact, as the Commissioner recognized by such language, that the business of mining companies consists primarily in the conversion of capital, and not in the creation of income. No doubt the Commissioner aimed to reach the "profits or gains" of mining operations and devised the scheme outlined in Treasury Decision 1742 to exclude "original capital investment cost" and catch the profits.

As we see the fallacies of the government's position they are these: First, it fails to recognize the results of the fact that the corpus of mining premises constitutes capital, and that such is the fact, regardless of cost price, present value, known or unknown value, increase in value, or extension or contraction of the corpus; second, it fails to recognize the fact that proceeds of the sale of capital assets can be nothing but capital; third, it confuses the meaning of the word "profits" with the meaning of the word "income."

On the third point the main argument is as follows:

The government apparently proceeded at first upon the theory that there must be a limit upon the depreciation to be allowed to a mining corporation. In the administration of the act, different ideas seem to have prevailed in different places. By some it was contended that the limit should be the cost of the mining premises and improvements. By others it was contended that the limit should be the capitalization of the company. Neither of these tests reaches the value of the substance of the corpus of the capital. There is nothing in the act which indicates that as to any corporation there shall be any limit of depreciation. The act provides for the deduction of "depreciation," and what is "depreciation" is a question of fact. When in any year the corpus of the capital has depreciated, then there has been depreciation to deduct. Capital is a tangible, definite thing—quite distinguishable from "cost of capital," or from "par value of authorized capital."

Deduction for "reasonable depreciation" is allowed. Nowhere in the act is any authority given for arbitrary administrative exclusion of that which is actual depreciation. And we contend that, if a part of the capital assets are removed and sold, the property, as it originally stood, is actually depreciated in value to the exact extent of such removal.

As an actual matter of experience, the original cost of the property must, from its very nature, be highly speculative. The values in the property are invisible and impossible of determination. They may be worth many times the cost or they may be worth nothing. We submit, therefore, that any such basis of capitalization is purely fictitious; and this contention is sustained by the manner in which mining companies are capitalized.

The brief goes on to state that a very large number of cases both of metallic and coal-mining corporations are awaiting the decision of the Court in this case and it is urged that the matter shall be settled as quickly as possible on that ground. In closing the attorneys say:

"First—That Section 38 of the act in question does not apply to mining corporations.

"Second—That the proceeds of mining operations are not 'income' within the meaning of the act.

"Third—That, if such proceeds are held to be income within the meaning of the act, then the value of the ores extracted, when in place, should be deducted as depreciation before the tax is computed."

❋

The Molecular Heats of Formation of ferrous and manganous silicates from FeO or MnO and SiO_2 were determined to be FeO, SiO_2, 5905; and MnO, SiO_2, 7725 cal. ("Comptes rend.," p. 121, 1913.)

EDITORIALS

The Halt in Copper

During the last fortnight the copper market has weakened materially from the highest point, about 16¾c., of the recent rise, and as is always the case during such relapses some nervousness is exhibited. However, the behavior of the market looks quite natural.

During the period of advancing prices a great deal more copper was probably sold at under 16c. than above that figure, but during the buying movement, as a whole, consumers contracted for a very large quantity. The manner in which the buying and selling of copper is conducted produces alternate periods of big business and little business. Manifestly, consumers cannot stock up and keep on buying all the time.

There comes a lull and the larger selling agencies, if their order books are well filled, stay out of the market, asking a price at which they are willing to make further contracts and remaining more or less unconcerned if nobody at the moment is willing to pay it. There are other sellers, however, who want a market all the time and who immediately offer copper down, trying to find a price at which buyers will be interested. The volume of business transacted in this way is apt to be relatively small. The trader is able to hedge by operations in the London market and the small producer, who is selling his own product, takes no risk. If he has anticipated a broad downward swing, he may realize an average for the year that is better than the general run. If he be wrong he does not lose anything.

In the early part of this year we had a receding market in much the same way as we are having now. One producer, commonly rated as a small producer, although it is not so very small, undersold its competitors right along, snapping up the small business that was offered and accepting prices that looked almost ridiculous at the time. These prices looked big a little later when the larger producers recognized conditions and cut their prices sharply, the time having come when they needed to sell copper.

In such circumstances the big sales are invariably made at the bottom—at the price which interests consumers and speculators in taking over large blocks. These are usually the Europeans. The Americans seldom buy much when copper is really cheap. They come in on the subsequent advance. In this respect their experience last summer was in no wise different from what has happened to them on many previous occasions. The inability of Americans to buy cheaply has indeed become proverbial in the trade.

After a smart advance there are always some belated buyers. The market sags off under the influences that we have above related. The belated buyer, who is usually looking for bargains, holds off to get copper a little cheaper, then a little more cheap. In his maneuvers he is very apt to overstay his market and end by paying a stiffish price after all.

It all depends upon the general economic trend. If business be turning bad, if consumption be on the wane, we shall have a repetition of previous experiences, viz., a constant fishing for the market by the small sellers, then drastic cuts by the big ones, then more fishing and more cuts, and finally the making of a bedrock price. On the last slump this was 13¾ cents.

If, on the other hand, business be holding good, if consumption continues large, the buyers will appear again in the market as soon as it seems wise to them to contract for the additional supplies that they will need and the market will rise sharply from the level created by the small sellers, because the latter will neither have much to sell nor will they want to sell what they have got if the fish are biting good.

Statistically, there has been no recent change in the copper situation. Consumption continues large and production continues checked. These conditions have led to a diminution of stocks to a figure smaller than since the early part of 1907 when the price of copper was 25c. What especially concerns the producers just now, however, is the selling of the copper that he expects to have ready for delivery next December, not that which he has got on hand. Consumers for the moment are reluctant to contract heavily for December copper, but there is no good evidence that they will be indisposed a little later on, inasmuch as the use of copper is apparently experiencing no falling off. Nor is there any reason to expect any material increase in production in the near future. The Mexican trouble is undoubtedly going to continue for a long time yet, while even if the Lake Superior strike should be settled today it will be next spring before the Michigan mines can regain their normal rate. The change in some quarters from high optimism to undisguised nervousness, if not real pessimism, during the last fortnight is too little supported by indications and in fact is to sudden to be very convincing. It seems rather to reflect qualms arising from the speculative markets in which anticipatory operations may have been overdone.

⁂

The Lead and Zinc Schedules

We now know definitely what the new tariff on lead and zinc, and their ores, is going to be. The schedules are as follows: On lead, 25% *ad valorem;* on lead in ore, ¾c. per lb.; on zinc, 15% *ad valorem;* on zinc ore, 10% *ad valorem* on the zinc content thereof.

The present price of lead in the London market is about 4.35c. The duty on importations would be about 1.09c. The duty on lead in ore would raise the price of Mexican and Canadian lead, smelted here, to about 5.10c. The New York price for lead is now about 4.60c. Obviously no importations are threatened at present.

The European price for lead is, however, rather above the normal. We may see it happen some day that foreign lead will be entered for consumption here. Conversely, we may at some times find ourselves on the verge of exporting our own lead to Europe.

The broad effect of the reduction of the duty on lead will be to bring the American and European prices more nearly together, and to lessen the opportunities for corners and squeezes here. Our market will be more stable, our consumers will benefit, and we do not see that our producers will be hurt.

In spelter the new conditions will be similar to what will obtain in lead, but will be a little more pronounced. The New York price at present is about 5⅜c.; the London price about 4.56c.; the present rate of duty will be about 0.68c. Allowing 0.25c. for freight and charges the present cost of foreign spelter in New York would be about 5.50 cents.

If the New York price should rise to the European parity, however, it would only be the Atlantic seaboard markets that could be invaded. Geography would still protect the Ohio Valley, the great center of spelter consumption. This assumes that the London price would remain at 4.56c. In fact any overtures from here for the purchase of any large blocks of European spelter would probably put up the price over there. Last fall the conditions were different. The European convention was then willing to sell privately at large concessions from the openly quoted market and did so.

We shall no doubt see a repetition of these conditions both ways. We may not export any spelter to Europe so long as we are pinched for ore supply, but we venture the prophecy that we shall some day see zinc smelting done in our Atlantic seaports, importing ore from Australia, Asia and elsewhere, and then we may export spelter once more.

America has not always been helpless in the zinc and lead trade. Back in the '90s we used to export a lot of spelter, and in the '70s and in the '40s we used to ship abroad some big tonnages of lead.

The matter of the new tariff on zinc ore is the most complicated thing. In previous editorials we called attention to the original oversight of Congress and the attempt to correct it. The zinc-ore section now reads: "10% *ad valorem* on the zinc contained therein." How is this to be determined? Is the zinc content to be reckoned at the pound price *loco* St. Louis or New York? We fancy not, inasmuch as the duty so computed might be in excess of the total ore value, which would be a *reductio ad absurdum* and manifestly not the intent of Congress. The matter of ore value is no simple thing, however. Suppose a cargo of ore be imported from Vladivostock through Baltimore for Clarksburg, W. Va. Is the duty payable on the value at Vladivostock or at Baltimore? Anyway, the duty will vary according to the source of the ore or the port of entry and some places will have geographical advantages.

The zinc smelter will pay ¾c. per lb. on lead content of which he will not recover any, or at the best perhaps 70%, but he will be free of duty on silver value. How is the zinc value and the silver value to be separated in the case of many ores? Will the zinc smelters have to adopt settlement sheets similar to those of the silver-lead smelters? What will become of existing sliding-scale contracts? Here is a maze to be unraveled by treasury rulings, and by the courts. We prophesy that the latter will have something to do ere long. Barring some of these tangles, however, the smelters have gained an important step in the direction of free ore.

The Situation in Spelter

The zinc smelters complain bitterly of their present predicament. The margin between the prices of ore and spelter leaves them but little profit anyway, in some cases no profit, and many of them are still operating at reduced capacity, which of itself increases their operating cost per ton of ore. Normally they would cause the ore producers to shoulder part of the burden, but of late there has been such a scarcity of ore supply that the miner has things his own way.

Amelioration of the situation would come naturally through the cessation of smelting by some of the less favorably situated concerns, which, by reducing the supply of spelter, would cause the price to rise and by reducing the demand for ore would cause the price of it to fall, thus restoring the normal margin.

However, the price for spelter cannot now be caused to rise much in this way, because only a little advance would bring in European spelter. On the other hand, the reduction in the tariff on ore is not going to help the smelters much right away, because their main supply of foreign ore, Mexico, is cut off anyhow and is likely to remain cut off for some time to come.

The outlook is apparently that the price for spelter cannot go materially lower, for the reason that any further reduction of ore supply would be unpermissible. On the other hand, there cannot be any material advance so long as Europe has got spelter to sell us at a little above the present price.

Probably there will be a market fluctuating within relatively narrow limits for a while to come, during which time our smelters will have to worry along in an uncomfortable way. The European convention has its restriction of output in effect now, which is causing things to right themselves over there. When its stocks have been absorbed it is likely that there will be an advance in price both there and here, providing that domestic demand does not go to the dogs in the meanwhile, which we do not anticipate.

⁂

The Butte & Superior Co. is now reporting tons of ore milled, zinc content of concentrates, percentage of recovery and percentage of zinc concentrates. This is an improvement over former style of report and leaves little to be desired. The tons of concentrate produced might advisably be stated. However, anyone interested can, of course, figure it from the data given by the company. The Butte & Superior company now appears to be doing very well, upon which both its management and its stockholders are to be congratulated.

⁂

The supply of crude copper for American refineries in July, 1913, according to our statistics was 139,315,203 lb., which was about the normal monthly rate so far in 1913. This figure does not, of course, reflect the decrease in the Lake Superior production, which did not appear statistically until August.

⁂

The Old Dominion-Hyams litigation drags on like the case of Jarndyce vs. Jarndyce. Some of the older generation may know what it is about; the younger certainly don't. We wonder if anybody does, except Mr. Hyams.

BY THE WAY

The Sheep Creek Mother Lode mill illustration on the first page of the Journal of Sept. 20 shows a fine expanse of roof. A correspondent tells us it was a great error to let this get by without the inscription "Read the E. & M. J."

⁂

A Curb broker's market letter on mining stocks contains the following gem: "In this connection we repeat what we have many times said before: An outright purchase of almost any old stock on the Curb is far safer than a 10-point margin on the soundest issue on the Stock exchange." But neither way is our idea of "Safety First."

⁂

The newspapers report a peculiar accident at Clifton:

A large force of men is at work chiseling and sawing out 500 tons of solid matte, "frozen" in the first furnace of the Arizona Copper Co.'s new smeltery. It is expected that at least six months will pass and many thousand of dollars will be spent before the smelter can be used. In the meantime the old plant will be operated.

The furnace was lined with firebrick. Between each brick was a small space. It was supposed that the bricks would melt and run together as soon as a fire was started under the furnace. But the bricks were defective and did not melt. The molten metal ran into the interstices.

As soon as this became known the fires were drawn, leaving the matte inside the furnace to cool and become solid. It is now a solid mass of 500 tons, 99% copper.

We get the impression that something in the way of a furnace mishap has occurred, but we certainly don't know what it is.

⁂

The financial editor of the *Evening Post* recently summed up the commercial situation thuswise: "We have had the autumn beginning with easy money where stringency had been predicted, and the harvests turning out such as to encourage equanimity where disaster had been predicted. We have also seen the completion of the tariff legislation without any accompanying mercantile disturbance. On the basis of all this, prices have rather generally recovered all the losses incurred since the pessimistic view of things began to prevail in the early weeks of the year. Those predictions are now known to have been mistaken. There are left the usual autumn problems, such as always make the last three months of the year a period of more or less financial uncertainty, at home and abroad. But that is a different thing from the cataclysm which used to keep timid investors awake at night, between February and July."

⁂

The following tale of romance was related in the New York *Sun,* as a letter from Glens Falls, N. Y., date of Sept. 18:

"Uncle Jim" Chase, a well known resident of Fort Ann, acting upon instructions received in a two-night vision, has discovered on his farm at Fort Ann a gold and silver mine supposed to have been abandoned 250 years ago and a large cave, in which gold and silver bullion and coins were hidden there at that time.

Samples of the gold ore sent to Albany for analysis have shown that they contain $2.60 in gold to the ton, while the silver ore assays at about the same ratio. The samples also contain a large percentage of nickel. Mr. Chase, who owns the farm upon which the mine and cave are located, has filed a miner's claim with the Secretary of State.

Uncle Jim's statement rivals those of fiction. Uncle Jim, who is a veteran of the civil war, in which he served as a sergeant, and is a hunter, trapper, crack shot and man of his word, tells the following tale:

An old Spaniard, one whose appearance was not altogether pleasing, appeared to him in a vision on two succeeding nights as he slept. The Spaniard told him to go to a certain spot on his farm back of Sly Pond, in the vicinity of Three Ponds in that part of the town of Fort Ann known as Michegann, and that he would find a cave there in which the Spaniard had mined and smelted and coined gold and silver 250 years ago.

"This stuff was left there and you're the man we want to have it," said the Spaniard, according to Mr. Chase. The mysterious man left that vicinity 250 years ago, when he built a stone wall across the cave, a short distance from its mouth. Just back of this wall, he told Chase, would be found a large iron chest, containing gold and silver coins and a large amount of bullion, both refined and crude, all abandoned by the Spaniard two and a half centuries ago.

Chase was considerably affected by the vision, but decided to await its repetition before he started out, and sure enough the same Spaniard appeared to him the following night.

Convinced that an effort to locate the gold and silver would cost him nothing more than a little work, if he should be disappointed, Chase started out early the next morning. He went to the place indicated by the Spaniard and did some excavating. He then covered up the entrance, had some samples, which he brought away, assayed, and is now preparing to open up his mine and reap the harvest which has been bestowed upon him.

This carries the New York up-State gold myth back about 250 years. The mine at which gold is mined, extracted, refined and coined, all in the same place, is new to us. We'd like to see that kind of a mine, and may be we'll send a member of our staff to Fort Ann. Not, however, until we have been on the lookout for some promoter's literature.

⁂

The prospector's burro or mule, has in some instances in the United States, given way to the more speedy automobile, but outside of the Kalgoorlie gold field, in Western Australia, the camel has not been thought of as a beast of burden, in connection with prospecting or the operation of mines. It is therefore of interest to note that T. H. Trimble, a prominent stockman of Texas, is the leader in a plan for importing 200 camels, trained in the Old World, to be beasts of burden. It is proposed to place the camels on a ranch on the Rio Grande, about 150 miles south of Cape Verde, where a breeding station has been established. All the states in the region once mapped as the Great American Desert, are thought to be rich in precious metals, especially gold, but owing to the lack of water it has been extremely difficult for prospectors to pack in supplies enough to last over a sufficiently long trip to explore the country well. It is thought with a camel caravan, longer journeys will be possible through the dry territory. The use of camels in this section, states the *Independent,* is not an original idea, for in President Pierce's day the plan was tried out under Secretary of War Jefferson Davis. Then about 40 animals with their native drivers were introduced. Just about when they were becoming acclimated and ready for the preliminary experiment, the Civil War broke out. Mr. Davis became president of the southern confederacy and partly through feeling against him and everything pertaining to him, partly because of the unsettled condition of the country and lack of suitable stocking places, the plan was abandoned. Some of the buildings remain that were used by the camels and their keepers, and on rare occasions prospectors, returning from the wildest, almost inaccessible sections where water is found in springs or in small mountain streams, report seeing one or two of the strange, uncouth beasts, the presence of which nearly always is a startling sight to one ignorant, as most people are, of the story of their introduction.

Gold Production of the World

In our statistical number, Jan. 11, 1913, we presented a table giving the gold production of the world for 1912. At that date the output for the closing months of the year in those countries which make periodical returns, was necessarily estimated. This was done on a conservative basis in order to avoid possible errors. We now reproduce that table with such corrections as we are able to make from official and other reports received from the various countries. As corrected, it gives the gold production of the world in 1912, as compared with that for 1911, as follows:

TABLE I. GOLD PRODUCTION OF THE WORLD

	1911	1912	Changes
Transvaal	$170,059,273	$188,599,260	I. $18,539,987
Rhodesia	12,986,000	13,166,230	I. 180,230
West Africa	5,197,488	7,386,028	I. 2,188,540
Madagascar, etc.	2,706,639	2,925,000	I. 218,361
Total Africa	$190,949,400	$212,076,518	I. $21,127,118
United States	$96,890,000	$93,451,500	D. $3,438,500
Mexico	24,886,100	22,500,000	D. 2,380,100
Canada	9,762,100	12,559,288	I. 2,797,188
Central America, etc.	3,399,000	3,632,500	I. 233,500
Total North America	$134,931,200	$132,143,288	D. $2,787,912
Russia, inc. Siberia	$32,151,600	$27,635,500	D. $4,516,100
France	1,707,100	1,847,000	I. 139,900
Other Europe	2,584,900	3,615,000	I. 1,030,100
Total Europe	$36,443,600	$33,097,500	D. $3,346,100
British India	$11,054,100	$12,115,162	I. $1,061,062
British and Dutch East Indies	4,726,500	4,925,000	I. 198,500
Japan and Chosen	6,896,900	7,165,000	I. 268,100
China and others	3,769,600	3,750,000	D. 19,600
Total Asia, not inc. Siberia	$26,447,100	$27,955,162	I. $1,508,062
South America	$10,421,800	$12,425,000	I. $2,003,200
Australasia	60,184,200	56,635,800	D. 3,548,400
Total	$459,377,300	$474,333,268	I. $14,955,968

The increase in 1912 over 1911 was 3.3%. As will be seen from the table the gain was entirely from the African mines. Outside of that continent no important producer except Canada made any considerable gain. The causes of most of the changes have been heretofore discussed.

The total for 1912 was $60,352,624 above the average of the past 10 years. The second table gives the world's production of gold for 20 years past:

TABLE II. GOLD PRODUCTION OF THE WORLD FOR 20 YEARS.

1893	$158,437,551	1903	$329,475,401
1894	182,509,283	1904	349,088,293
1895	198,995,741	1905	378,411,054
1896	211,242,081	1906	405,551,022
1897	237,833,984	1907	411,294,458
1898	287,327,833	1908	443,434,527
1899	311,505,947	1909	459,927,482
1900	258,829,703	1910	454,213,649
1901	260,877,429	1911	459,377,300
1902	298,812,493	1912	474,333,268

It is rather early to make any prediction for the total of the current year, but it looks now as if there would be no increase over 1912. The Transvaal output has been kept down by the miners' strike and other causes. It does not appear probable that the United States will show any material change from last year. Australian production for the first half of the year showed a considerable decrease, and Mexican mining is still affected by the disturbed state of the country. On the other hand, Canada may be expected to gain, and some of the causes which brought about a decrease in Russia have been removed. It may be that the losses and gains so far known will nearly balance each other, but a total about equal to that for 1912 seems to be about the best that can be expected.

September Mining Dividends

Dividends for September of United States mining companies making public reports amount to $6,475,567 paid by 31 companies; iron, metallurgical and holding companies pay $13,441,816; and Canadian, Mexican and Central American companies $1,612,804. This compares with 30 companies paying $5,956,294 in September, 1912; with $10,704,967 paid by industrial, iron and holding companies, and $1,610,181 paid by Canadian, Mexican and Central American companies. This increase is shown despite a decrease of $600,000 in Calumet & Hecla's dividend of this last and last September.

The effect of the strike in the Missouri lead region is shown in the 33⅓% cuts in Doe Run and St. Joseph Lead Co.'s dividends; Calumet & Hecla and Quincy reflect the Michigan disturbances. Grand Central, of Utah, takes this occasion to pay a belated July disbursement, and Bingham-New Haven pays for the first time since July, 1912.

United States Mining Companies	Situation	Per Share	Total
Bingham-New Haven, c	Utah	$0.10	$22,869
Bunker Hill & Sull., l.s.	Ida.	0.20	65,400
Bunker Hill Con., g.	Calif.	0.05	10,000
Calumet & Arizona, c.	Ariz.	1.25	745,441
Calumet & Hecla, c.	Mich.	6.00	600,000
Chino, c.	N. M.	0.75	583,194
Doe Run, l.	Mo.	1.00	65,749
Federal Min. & Smelt., pfd.	Ida.	1.50	179,791
Fremont, g.	Calif.	0.02	4,000
Frontier, z.	Wisc.	2.00	2,500
Golden Cycle, g.	Colo.	0.02	30,000
Grand Central	Utah	0.05	25,000
Hecla, l.s.	Ida.	0.02	20,000
Homestake, g.	S. D.	0.65	163,254
Nevada Consol., c.	Nev.	0.37½	749,790
New Idria, q.	Calif.	0.10	10,000
North Star, g.	Calif.	0.20	50,000
Pittsburgh-Silver Peak, g.	Nev.	0.02	55,800
Quincy, c.	Mich.	1.00	110,000
Ray Consol., c.	Ariz.	0.37½	542,757
Saint Joseph, l.	Mo.	0.10	100,000
Silver King Consol., s.	Utah	0.25	155,000
Superior & Pittsburgh, c.	Ariz.	0.38	569,922
Tennessee, c.	Tenn.	0.75	75,000
Tom Reed, g.	Ariz.	0.06	54,573
Utah Co.	Utah	0.75	1,186,627
Wasp No. 2	S.D.	0.02	10,000
Yellow Aster, g.	Calif.	0.05	5,000
Yellow Pine, l.z.s.	Nev.	0.02	19,000
Yosemite Dredging, g.	Calif.	0.10	2,400
Yukon, g.	Alas.	0.07½	262,500

Iron, Industrial and Holding Companies	Situation	Per Share	Total
Amer. Smelting & Refining, pfd.	U. S.	1.75	875,000
Amer. Smelting & Refining, com.	Mex.	1.00	500,000
Crucible Steel	U. S.	1.75	427,638
General Asphalt, pfd.	U. S.	1.25	164,120
General Chemical, com.	U. S.	1.50	128,382
Guggenheim Exploration	U. S., Mex.	0.75	623,799
Harbison-Walker, com.	U. S.	0.50	90,000
International Nickel, com.	U. S.	2.50	948,133
Lackawanna Steel, pfd.	U. S.	1.75	612,115
National Lead, com.	U. S.	0.75	154,915
National Lead, pfd.	U. S.	1.75	426,433
Phelps Dodge, c.	U. S. Mex.	4.50	2,025,000
Pittsburgh Steel, pfd.	U. S.	1.75	112,500
U. S. Steel, com.	U. S.	1.25	6,353,781

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Blanca y Anexas, g.s.	Mex.	0.90	63,000
Chontalpan, g.s.l.z.	Mex.	0.50	3,500
Crown Reserve, s.	Ont.	0 02	35,376
Dos Estrellas g.s.	Mex.	1.50	450,000
Granby Con., c.g.s.	B. C.	1.50	222,721
Hedley, g.	B. C.	0.50	60,000
Hollinger, g.	B. C.	0.15	90,000
Kerr Lake, s.	Ont.	0.25	150,000
Lucky-Tiger, g.	Mex.	0.05	35,767
Mexico Mines of El Oro, g.s.	Mex.	1.44	262,440
N. Y. & Hond. Rosario, g.	C. A.	0.20	40,000
Peñoles, l.s.	Mex.	1.25	150,000
Standard, s.l.	B. C.	0.02½	50,000

Dividends for the first nine months of the year are $54,015,894 for United States mining companies; $87,213, 660 for iron, industrial and holding companies; and $16,654,423 for other North American companies.

❖

The Otavi Mines & Railway Co., German Southwest Africa, for the fiscal year 1912-13, reports that it has shipped abroad from one of its prospects in Otavital 200 tons of a copper-lead ore containing 10% vanadic acid. The latter occurs in the mineral "mottramite," which is a hydrous vanadate of lead and copper.

PERSONALS

Franklin Guiterman left New York last week for Denver.

G. W. Crane will spend about a year in the Tintic district, Utah.

E. A. Holbrook has been appointed assistant professor of mining engineering at University of Illinois.

C. T. Griswold of the Associated Geological Engineers is engaged in examination work in eastern Idaho.

Sir Alfred Mond, head of the Mond Nickel Co., sailed from England Sept. 23 for a two-months visit to Canada.

Albert G. Wolf has recently been appointed chief mine engineer for the Mason Valley Mines Co., Thompson, Nevada.

Charles Kingsley, formerly manager of the Colonial mine, Cobalt, is making an inspection of gold mining properties at Kirkland Lake, Ontario.

Godfrey Doveton is in the Mezquital del Oro district of Zacatecas, Mexico, making extensive tests on the Mezquital and San Carlos gold ores.

John Hare, a British financier, is on his way to Canada to investigate several Cobalt properties in the interest of prospective English investors.

S. O. Andros has been appointed associate in mining engineering at the University of Illinois. He was recently with the Illinois Geological Survey.

John T. Reid has been appointed consulting engineer and general manager for the Buffalo Valley Gold Mining & Leasing Co., operating mines at Volney, Nevada.

H. C. Miller, mining engineer and geologist, until recently with Daniels & Osmont, San Francisco, has opened an office of his own at Bishop, Inyo County, California.

Stanley N. Graham, manager of the Peterson Lake mine, Cobalt, Ont., has been appointed professor of mining engineering in the Technical College, Halifax, Nova Scotia.

L. E. Young, recently with the Missouri School of Mines, is now part-time instructor in mining at the University of Illinois, and at the same time is carrying on some graduate work in economics.

W. A. Rose, formerly chief engineer for the Oliver Iron Mining Co. in the Hibbing district, Minnesota, has been appointed chief mining engineer for Pickands, Mather & Co., with offices at Duluth.

C. M. Smith, who has been secretary and treasurer of the Colonial Iron Co. operating the blast furnace plant at Riddlesburg, Penn., has been made president of the company, succeeding H. H. Adams, resigned.

Capt. Bernier, the Canadian Arctic explorer, who returned on Sept. 25 from Baffins Land, reports there is no gold in that region, and that previous statements attributed to him that gold had been discovered were incorrect.

Clyde H. Jay, vice-president and mine manager of the Giant Eclipse Consolidated Mines Co., operating near Salida, Colo., has been appointed also consulting engineer for the New Discovery Mining & Milling Co. in the same district.

John T. Fuller has opened an office in Little Rock, Ark., for the practice of mining engineering and is prepared to report on, perform the engineering work, and act as agent for mines and mining properties in that state and section.

John M. Boutwell, consulting geologist for Phelps, Dodge & Co., having finished his report on the property of the Detroit Copper Mining Co., has left Santa Barbara for Globe, Arizona, where he will make an examination of the Old Dominion Copper Mining & Smelting Co. property.

W. M. Brewer, who at the time was traveling in Lillooet district, investigating mining conditions for the British Columbia Department of Mines, lost his horse, which slipped off a trail and fell down a steep mountain side, fully 1000 ft. Fortunately Mr. Brewer was not riding the horse when the accident happened.

Adolph Greiner, since 1887 general director of the Société John Cockerill, Seraing, Belgium, was elected president of the Iron & Steel Institute at its autumn meeting at Brussels. His whole career has been with the Cockerill company, which he entered as a chemist. Under his management the company adopted the basic bessemer process and through his leadership it has been foremost in the utilization of blast-furnace and coke-oven gases for the generation of power in iron and steel works.

OBITUARY

Morris Doblin, a prominent mining man of Baker City, Oregon, was shot and killed at the Highland mine, near that place, on Sept. 22 by an Austrian miner, who escaped.

Robert C. Neal, Harrisburg, Penn., died September 21, aged 66 years. He was a founder of the Harrisburg Rolling Mill Co. and had been connected with the Eleanor Iron Co., Hollidaysburg, Penn.; Tyrone Forges, Tyrone, Penn., and Lochiel Iron Works, Harrisburg, Penn. He was the son of William Neal, a prominent iron manufacturer in his day.

Otto Dolling, of Angel's Camp, Calif., died in San Francisco, Sept. 3. Mr. Dolling had been in ill-health for several years. He was taken to San Francisco for possible treatment about a week before his death. Mr. Dolling was the owner of the Angel's Hotel and was interested in mining. He was one of the owners of the Dolling mine, which is sometimes known as the North Star, at Angels. He was born in Holstein, Germany, in 1849, and went to California in 1869, and was located at Knight's Ferry. In 1888 he bought the Angel's Hotel and conducted it for about 20 years, and then leased it out. About two years ago he resumed the management. He was still interested in the mining enterprises at the time of his death. In 1886 he was married to Mary Stickle, daughter of the late George Stickle, an Angel's Camp pioneer.

Jabez Burton Stubbs, formerly vice-president of the Struthers Furnace Co., Cleveland, O., died Sept. 19, aged 82 years. He was born in Poland, O., and started his career as a railroad telegraph operator. Called to Chicago, he met W. C. Runyon, now president of the Struthers Furnace Co. Together they organized a commission business to deal in pig iron under the name of Stubbs & Runyon. While residing in Chicago he was a member from 1886 to 1891 of the Cleveland firm of Runyon, Stubbs & Mack, but did not take an active part in the business. In 1895 Mr. Stubbs removed to Cleveland and again formed a partnership with Mr. Runyon under the name of Runyon, Stubbs & Co. While this partnership was in existence the Struthers Furnace Co. was formed with Mr. Runyon as president and Mr. Stubbs as vice-president, which connection he held until six years ago, when he retired from active business. He leaves a widow and a daughter.

William Armstrong Ingham died at his home in Philadelphia, Sept. 23, aged 87 years. He was born in Pennsylvania and graduated from the Rensselaer Polytechnic Institute at Troy, N. Y., also studying law as well as engineering. He was for a number of years connected with the Pennsylvania Geological Survey, being associated for a long time with the late Professor J. P. Lesley. He also made many geographical studies for the state. He took an active interest in the development of the Broad Top coalfield, and was one of the organizers of the East Broad Top R.R. & Coal Co. He took much interest in many public movements for economical improvement. In spite of his age, he continued actively in business until a few days before his death. At the time of his death, he was president of the Highland Coal Co., the Broad Top Improvement Co., and the Beverly Ore Co. He was also secretary of the Geological Survey Board of Pennsylvania and a member of the American Philosophical Society, the Franklin Institute and the American Institute of Mining Engineers.

SOCIETIES

Mining & Metallurgical Society of America—The San Francisco section held a meeting in Oakland, Sept. 15, and discussed the proposed affiliation with the American Institution of Mining Engineers. The meeting was attended by H. Foster Bain, E. B. Kimball, Robert E. Cranston, Philip R. Bradley, of San Francisco; Mark L. Requa, E. L. Oliver, of Oakland; Prof. S. B Christy, Prof. A. C. Lawson, of the University of California, and C. W. Merrill, of Berkeley.

Utah Society of Engineers—At the first regular meeting following the summer vacation, Sept. 19, papers dealing with the smoke problem of Salt Lake City were given. A. H. Thiessen, director of the United States Weather Bureau presented a paper, "Data on the Atmospheric Conditions in Salt Lake Valley." Mr. Thiessen said that observations on smoke-haze and fog had been tabulated since 1891. It is frequently

difficult to distinguish between these two. Haze is generally supposed to consist of minute dust particles in the air, but also of minute particles of water on dust near the earth's surface. The haze prevalent in autumn is probably due to the drying leaves adding to the dust. Mr. Thiessen called attention to smoke as distinguished from haze or fog, and explained the conditions under which fog and clouds are brought about. The records of the Weather Bureau show that sunshine varies from as high as 83% in July to as low as 43% in December and January. A tabulation of the number of smoky and foggy days since the station was established shows the greater number to be in November, December, January and February. From April to September inclusive there is practically no fog or smoke. The hazing effect of water vapor is intensified by its association with dust particles, which are thrown into the air by combustion and other means, and give the water a surface on which to condense. A paper by O. W. Ott on "Possibilities of Reducing the Smoke Production in Salt Lake City," called attention to estimates of the loss through smoke in some cities, varying from $8 to $12 per capita annually. The theory of combustion was discussed, together with furnace construction and operation. Prof. E. H. Beckstrand gave statistics showing the coal consumption of the city to be 350,000 tons annually, the greater part of this being consumed during six months of the year. About 2% of the total weight of the coal goes up in smoke, setting free 40 tons of soot daily. Stoves and furnaces in private homes were responsible for a great deal of this amount. A system of community heating plants was suggested as a remedy. Heat could be supplied from these plants at a saving over that from individually operated furnaces. The feasibility of a municipal heating plant to overcome a large part of the smoke nuisance is to be looked into by a committee named at a meeting of the Salt Lake Municipal League.

INDUSTRIAL NEWS

The Bury Compressor Co., Erie, Penn., is starting the erection of an addition to its plant, extending the main plant 100 ft. This is necessary on account of increase in their business.

The Hardinge Conical Mill Co., 50 Church St., New York, report orders from the National Copper Co., Wallace, Idaho for grinding machinery which includes machinery for preliminary granular fine crushing as well as the final regrinding and from the Atbasar Copper Co., of Russia for six of the largest size mills to be equipped with Hardinge type manganese steel liners.

F. K. Brewster, Inc., has been incorporated under the laws of the State of New York, with a capital stock of $500,000, to manufacture blasting caps, electric blasting caps and fuse. Its plant and factory, now in course of construction, is to be located near Port Ewen, New York. The officers of the company are president and treasurer, Frank K. Brewster, secretary Roswell S. Nichols. The other directors of the company, are Paul Butler, of Lowell, Mass., John J. Heney, of Ottawa, Ontario, and Oscar S. Phillips, of Suffield, Connecticut.

A new type of rotary power pump has just been developed by the Goulds Manufacturing Co., Seneca Falls, N. Y. This pump differs from the rest of the line of pumps of the same capacity in that gear cams have been substituted for the three-toed cams used in the remainder of the line; and the gears on the cam shafts have been eliminated. Two sizes are built: No. 1 has a capacity of 25 to 50 gal. per min. at 225 to 450 r.p.m. and No. 2 has a capacity of 50 to 100 gal. per min. at 225 to 450 r.p.m. Both pumps are suitable for pressures up to 100 lb. or 230 ft. elevation.

The Ingersoll-Rand Co., of New York, has received an order from the Inspiration Consolidation Copper Co. for a heavy-duty cross-compound compressor to supply air for mine use at 95 lb. pressure; it will have a displacement capacity of 8500 cu.ft. and will be direct connected to a 2200-volt, three-phase, 25-cycle Westinghouse synchronous motor. They also received the order for the heavy-duty, four-stage compressor that will be used to furnish air at 1000 lb. pressure for operating the H. K. Porter compressed-air locomotives to be used for mine haulage; this compressor will have a displacement of 1325 cu.ft. and will be operated at 107 r.p.m., being direct connected to a 2200-volt, three-phase, 25-cycle General Electric synchronous motor. The company has also received an order for a 900-cu.ft. Imperial cross-compound belt-driven compressor for the Calumet & Arizona Mining Co. to be used at its development operation near Superior, Arizona.

TRADE CATALOGS

Atkinson & Sill, 515 Hollingsworth Building, Los Angeles, Calif. Catalog. Overstrom classifier. Illus., 30 pp., 6x9 in.

Morris Machine Works, Baldwinsville, N. Y. Catalog. Centrifugal pumps, hydraulic dredges, steam engines. Illus., 126 pp., 6x9 in.

The Westinghouse Electric & Mfg. Co. report the publication of the following:

Folder 4187 covers the type KB Section Insulator. The iron parts of this device are sherardized, and wearing parts are renewable. It is said to be an unusually strong and light weight insulator.

Leaflet No. 3569 describes and illustrates the shipment of transformers in tanks with oil. This method has become prevalent in the shipment of large transformers enabling them to be installed immediately upon arrival at destination.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

DRILLING—Improvements in Valve Apparatus for Percussive Rock Drills and the Like. G. Rayner, Abbeydale, Sheffield, Eng. (Brit. No. 8320 of 1913.)

MUCKING APPARATUS. Walter E. Trent, Reno, Nev. (U. S. No. 1,073,184; Sept. 16, 1913.)

ORE-CLASSIFIER. James W. Shields and Albert C. Thielmann, Hubbell, Mich. (U. S. No. 1,073,367; Sept. 16, 1913.)

SEPARATION—Ore and Like Separating Means. Pierre Jubien, San Francisco, Calif., assignor of one-half to P. A. Brangier, Agnew, Calif. (U. S. No. 1,072,732; Sept. 9, 1913.)

FEEDING TUYERE FOR ORE-TREATING FURNACES. Ernest Edmund Banes, Strathfield, near Sydney, N. S. W. (U. S. No. 1,073,463; Sept. 16, 1913.)

ORE TREATMENT—Process for Treating Ores. James Ainsleigh McLarty, Toronto, Ont. (U. S. Nos. 1,072,752 and 1,072,753; Sept. 9, 1913.)

ROASTING—Improvements in Furnaces for Roasting, Smelting or Otherwise Treating Ores. E. Buchholtz, Wealdstone, Eng. (Brit. No. 10,564 of 1912.)

ROASTING FURNACE. Francis Albert Curnow, Pittsburg, Kan. (U. S. No. 1,072,920; Sept. 9, 1913.)

SMELTING—Furnace for Smelting and Refining Ores. Willie Martin Bowles and Charley Osker Allen, Shawnee, Okla. (U. S. No. 1,073,468; Sept. 16, 1913.)

TUNNEL FURNACES—Process of and Apparatus for Feeding Cars into and through Tunnel-Furnaces. Alfred H. Cowles, Sewaren, N. J., assignor to The Electric Smelting & Aluminum Co., Sewaren, N. J. (U. S. No. 1,073,219; Sept. 16, 1913.)

CYANIDING—Agitating and Mixing Apparatus. Walter E. Trent, Reno, Nev. (U. S. No. 1,073,878; Sept. 23, 1913.)

BLAST FURNACE—Air-Cooled Blast Furnace. Richard H. Stevens, Munhall, Penn. (U. S. No. 1,074,097; Sept. 23, 1913.)

BLAST-FURNACE GASES—Apparatus for the Process of Purifying Blast-Furnace and other Gases and Freeing them from Dust Particles. Smith and Bagley and M. E. Feilman, London, Eng. (Brit. No. 10,341 of 1913.)

FURNACE-DOOR FRAME—(Water-Cooled). Luther L. Knox, Niles, Ohio, assignor to the Knox Pressed & Welded Steel Co., Niles, Ohio. (U. S. No. 1,073,144; Sept. 16, 1913.)

INGOT MOLDS—Apparatus for Handling Ingot-Molds. Samuel T. Wellman and Horace W. Lash, Cleveland, Ohio, assignors to The Liquid Forged Steel Co., Cleveland, Ohio. (U. S. No. 1,073,196; Sept. 16, 1913.)

PIG IRON—Improvements in Making Dephosphorized High-Grade Pig Iron. P. L. T. Heroult, New York. (Brit. No. 25,974 of 1912.)

PORTLAND CEMENT—Production of Portland Cement and Iron in a Single Furnace Operation. Joseph W. Richards, South Bethlehem, and Walter S. Landis, Bethlehem, Penn. (U. S. No. 1,073,820; Sept. 23, 1913.)

SIEMENS-MARTIN FURNACE. Kurt Albert, Wiesbaden, Germany. (U. S. No. 1,073,653; Sept. 23, 1913.)

ALUMINUM ALLOYS—Improvements in or Relating to Alloys of Aluminum. T. A. Bayliss, Warwick and B. G. Clark, London, Eng. (Brit. No. 19,452 of 1912.)

SUBLIMED WHITE-LEAD—Process and Apparatus for Treating Sulphide Ores. Ernest Ermond Banes, Strathfield, near Sydney, N. S. W. (U. S. No. 1,073,462; Sept. 16, 1913.)

STEAM SHOVEL. Thomas Schock, Eugene, Ore. (U. S. No. 1,074,018; Sept. 23, 1913.)

ORE CONCENTRATOR. Marion L. Porter, Silverton, Colo. (U. S. No. 1,073,928; Sept. 23, 1913.)

SEPARATING TABLE and Process of Separation. Henry M. Sutton, Walter L. Steele, and Edwin G. Steele, Dallas, Tex. (U. S. No. 1,073,644; Sept. 23, 1913.)

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—Sept. 24

The Dumping of Tailings from Quartz Mines on the Mother Lode in Amador County is again complained of by farmers on Dry Creek, near Galt, in Sacramento County. The complainants in the present case are Hugo and Martha Loll, who are not new complainants. The special attack at present appears to be against the Kennedy Mining Co. The Kennedy is nearing the completion of tailing wheels and it is expected that the plant will be in operation by Oct. 1.

Geological Survey Work in California includes a study of the area covering the Inyo range and the eastern slope of the Sierra Nevada with special reference to the ore deposits. Adolph Kopf has been assigned to the Bodie district of Mono County and the Darwin district of Inyo County. The copper mines in the foothills will be examined by B. S. Butler for the purpose of noting developments. The Panamint valley will be examined for potash deposits. J. D. Northup and R. W. Pack are assigned to the oil fields for the purpose of more detailed and geologic mapping. The primary purpose of this work is the classifying of lands and will probably result in the preparation of an economic report on the areas studied. F. C. Calkins and F. E. Mathes will visit the Yosemite Valley and make a detailed geologic study in preparation for the issuance of an educational bulletin describing the scenic features of this national park, explaining their origin and outlining the geological formations and history of the region. This will be illustrated with maps and photographs. Such a bulletin should be of great service as a guide to tourists visiting California. The water resources branch of the survey is continuing the investigation of the water resources. This work is done in coöperation with the state and others. The state and survey maintain 211 gaging stations. The determinations of water flow thus obtained are used in the design and construction of water-power plants.

DENVER—Sept. 27

The Moffat Tunnel Contract between the city of Denver and the Denver & Salt Lake R.R. for the joint construction of the tunnel has been turned over to attorneys representing both parties to be recast.

The Suit against the Mid-West Oil Co., which was scheduled to be heard by the U. S. Court of Appeals this week, will establish a precedent in establishing title to millions of acres of oil land, the value of which is almost inestimable. Technically, the suit involves title to 160 acres of oil land in Wyoming valued at $1,500,000 to $4,000,000. In reality, it involves the validity of an order issued by the President of the United States, Sept. 27, 1909, withdrawing from all forms of entry 3,041,000 acres in California and Wyoming, much of which is estimated to be worth $10,000 to $25,000 per acre.

The Colorado, Wyoming & Northern Ry. Co., with a capitalization of $6,000,000, has filed articles of incorporation. The company proposes to build a railroad from a connection with the Denver & Salt Lake R.R. at Craig to a connection with the Union Pacific at Rawlins, Wyo., a distance of 120 miles; and articles have also been filed for the United Yampa Collieries Co., with a capital of $4,000,000, to develop coal mines and properties in Routt and Moffat Counties. The two companies are backed by large Belgian interests headed by Camille Perin, managing director of the Société Generale des Charbonnage of Brussels.

The Outcome of the Coal Strike is yet in doubt, but it seems to be generally believed that the strike will not last long, or at least it is thought that the fuel supply will not be seriousy affected. In support of this opinion the fact is cited that in the northern coal field the strike, which was called three years ago, is still in effect, but Denver's supply of coal from that region has not been affected and has been supplied at normal prices. The killing of Marshal Lee, at Segundo, Sept. 24, widened the gap between miners and operators. The head of the union says, "Violence will not be countenanced," but still it continues. Three negro strike breakers were taken, Sept. 26, by 100 union men and their fate is still unknown. Governor Ammons says he will call out the militia if necessary to preserve peace.

BUTTE—Sept. 26

Taxing Gross Earnings is the object of a bill proposed by a committee of the Direct Legislation League and in spite of the arguments of representatives of the Anaconda company, the Montana Power Co. and other large corporations, the committee having in charge the initiative legislation for the League, decided to go on with the petitions for a vote on the proposition of taxing the mining and other companies on their gross earnings in addition to the general property tax they pay, and in addition to the heavy tax the mining companies pay on their net profits. It is curious to note that the members of the committee having the matter in charge for the league are all hostile to the Anaconda and allied interests. The bill to be proposed will place the tax on gross incomes as follows: Mining companies, ¼%; power companies, 1½%; express companies, 4%; telegraph companies, 2%; sleeping car companies, 4%; telephone companies, 2%. Based on last year's mineral output of $64,000,000 the mining companies will contribute $160,000 more in taxes, the power companies about $74,000, and other companies enough to bring the total up to $400,000 a year. The great danger in the proposed measure is that, in taxing gross output, it will discourage mining development in the state as few companies for years can show net profits.

SALT LAKE CITY—Sept. 25

The Secondary Enrichment of Copper Ores is to be studied at Bingham by several mining geologists under the direction of L. C. Graton, secretary and treasurer of the Copper Producers Association. The field work is being done by Augustus Locke, A. M. Bateman and E. H. Perry. Bingham is the second camp to be taken up, the party having visited Butte. Other districts in the southwest are to be studied. The Utah Consolidated and the Utah Copper in Bingham will receive especial attention.

Granite from Little Cottonwood is to be used in the new Utah state capitol. This was selected some time ago by the capitol commission, and Sept. 18, a contract to furnish this material was signed. Work has been started at the quarries, and the forces will be increased. Shipments are to begin by Nov. 15, but will probably be made before that, possibly within the next few weeks, or as soon as the Salt Lake & Alta R.R. has been completed. This line runs from Midvale to the quarries, and is awaiting the laying of the rails on the last part of the road. There are 10,000 cu.ft. of granite already quarried, and arrangements for machinery including derricks, boilers, drills, etc., have been made. The granite will be used from the base of the capitol building to the dome in place of the terracotta previously specified. The capitol commission is considering Utah marble, which compares favorably with marble from outside of the state, for the interior.

CALUMET—Sept. 27

The effect of the injunction, restraining the strikers from interfering with the men desirous of returning to work, has been to induce more men to apply for work. At the north end of the district, where operations have been suspended since the beginning of the strike, a back-to-work movement has been started. At the Ahmeek the pumps have been started and a force of men is working in the shafts making preparations for the resumption of operations. The Mohawk is taking on men and the North and South Kearsarge properties are clearing out the shafts, getting ready to hoist. The strike undoubtedly is wearing itself out, but in all probability it will never be officially declared off. The Federation is making a determined stand and the issue of recognition will be fought out. Several of the agitators have left for a tour of the Minnesota iron ranges to hold meetings and endeavor to secure financial aid for the strikers. Funds from various sources have been received by the Federation, but with a Lake Superior winter only a few weeks away, it will be necessary to give the men benefits of more than $1 per day. [The injunction against picketing and parading was dissolved Sept. 29, Judge O'Brien warning the Federation against violent tactics. On Sept. 30, Ahmeek detectives were fired on and violence among strikers broke out again.]

MARQUETTE—Sept. 27

Harnessing of the Black River is being considered by the U. S. Steel corporation, already the owner of a large waterpower plant in the mining fields of Upper Michigan, the hydraulic works on the Menominee River which supplies compressed air and electricity to the big Chapin mine at Iron Mountain. The Black River is a stream in the country tributary to the Marquette iron range. In the event of the development of a waterpower in that locality, the electricity generated will be utilized at the mines of the company at Ishpeming, Negaunee, Gwinn and Beacon, the machinery at all of which is now turned by steam. The Black River is eleven miles south of Ishpeming. It is a large stream, capable of supplying much power. Engineers have been in the field for several weeks, engaged in making a survey and estimates. Two hydro-electric plants are already serving mines on the Marquette range, one the big plant of the Cleveland Cliffs Iron Co. on the Carp River near Marquette and the other and smaller plant that of the Cambria Steel Co. on the Michigamme River at Republic. The latter has been in operation for many years, furnishing power only to the Republic mine. Electricity from the Carp River plant, which cost $1,000,000 or more, is transmitted over extensive stretches of country, serving the Cleveland Cliffs mines in the Negaunee, Gwinn, Ishpeming and North Lake districts, at all of which steam has been superseded almost entirely. The Black River is a larger stream than the Carp. It is understood that the cost of the plant will run into the hundred thousands of dollars.

ISHPEMING—Sept. 26

The Michigan State Tax Commission visited the Marquette range this week and gave the operators in the district a hearing on the suggested valuations on the companies' real and personal property. State Geologist Allen and his assistants have spent the last three months on the range looking over the mines and getting figures from the mine managers in order to have reliable data for deriving the valuations. All of the mining companies were represented at the hearing but there were few objections to the valuations of the mines, which have been placed on the tax rolls at lower figures, with one or two exceptions. The valuation has been raised on the American mine at Diorite, in which there is a large deposit of soft hematte. The greatest objection was made on the personal-property tax, especially the taxing of ore in stock, which is considered double taxation by the companies. Stockpiles are due mainly to climatic conditions and the contention is that it is an injustice to tax ore in the ground and then again when it reaches surface. Examples were cited where low-grade ore has been in stock for 10 years because there is no market for it, yet taxes have to be paid on it just the same. Many ores will be left in the mines and lost forever if the state is going to make a practice of taxing the poorer grades of ore at a high price when they reach the stockpiles. Lake Erie ore prices are taken as the basis for taxing ore in stock but this is objected to because the managers claim that if they have a pile of ore that cannot be sold because it is not wanted and of no use, that it is not worth the price quoted in Eastern markets and so should not be valued on that basis. Development work has been slow since the Finlay appraisal a few years ago and it will continue so if the state is going to do what the companies claim is unfair. The commission has not given any decisions as yet but will give out the valuations of mines and opinions concerning taxing stockpiles in the near future.

SWASTIKA—Sept. 26

The New Gold District of Kirkland Lake seems destined to become the graveyard of a great many disappointed hopes. While the earlier developments of the camp were of great promise, the results of later work are not so encouraging, and it would now appear as if there was little chance for more than two or three small properties. The Tough-Oakes property, formerly known as the Foster, has reached a depth of 200 ft. and has good ore all the way. It is learned, however, that the porphyry was encountered at the lowest level, and while it is not definitely known what effect this may have, it is the general opinion that the small, high-grade veins such as are found throughout this district will not persist far into that formation. Drifting is being done at the 100-ft. level and the results to date have been satisfactory. It now assured that this property will become a profitable producer although it is not expected it will ever be a large mine. In sinking the Burnside shaft, the porphyry was encountered at a depth of 35 ft. The shaft was continued vertically to a total depth of 100 ft. and a crosscut is now being driven to determine if the ore continue to that level. The results of this development will decide whether or not the property will be taken over by those holding the option, as the present terms of the option call for a heavy payment to be made in a month's time. Several other veins, which in places carry good ore, have been found on the surface, but so far, sufficient work has not been done to justify any opinion as to their ultimate value. On the Wright-Hargraves, high-grade ore is being bagged, but little sinking has been done, so that this property, while exceedingly promising in its present state of development, must be considered as an unknown quantity. On the Teck-Hughes, at the West end of Kirkland Lake, development on the 100-ft. level of the No. 1 vein which was found in the porphyry, has proved disappointing, and it has been decided to abandon this working and concentrate work on veins Nos. 2 and 3, where ore of satisfactory grade has been found on the surface. The oreshoots however, appear to be quite short and it is doubtful if a sufficient quantity of ore to give a reasonable return on the capital which would have to be invested, can be developed. Nothing of importance is being done on the other properties throughout the section and results, on a good many properties which at first seemed to hold considerable promise, have been disappointing.

FAIRBANKS—Sept. 1

J. A. Holmes, Director of the Bureau of Mines is visiting this city in order to ascertain what can be done by the bureau to better conditions in Alaska. He will soon start on a circuit of the creeks. He will later go over to the Nenana coal fields, and make an investigation of the deposits and of the transportation facilities. there. As soon as he has returned from the creeks he will leave for the mouth of the Wood River, and from there go up to the Nenana River. From the coal deposits he will go east to Donnellys to see how far the field extends, and thence down the Valdez trail and over to the Matanuska coal fields. There is a large government party at work there now and it is expected that they will have complete data which will be at the disposal of Congress at the next session.

GUADALAJARA, MEXICO—Sept. 10

The Smelting Works at San Luis Potosi was shut down in August because of inability to secure fuel. Coke now is being received, and it was expected to have three furnaces in operation before the end of September. The Teziutlan smelter of the Teziutlan Copper Co., has been able to operate up to this time. Fighting has been reported recently around Teziutlan, which is in the state of Puebla, but there has been no report of interference with operations. The Sombrerete Mining Co., was forced to abandon operations in the Sombrerete district of Zacatecas several months ago. Rebels now are working the dumps at the mines.

The Tonopah-Belmont Interests of Nevada have surrendered options on three antiguas in the Bolaños district of Jalisco, due to unsettled conditions in Mexico. The mines are the Zuloaga, Rosario and Condesa, and the options involved about $275,000. The price of the Zuloaga was $200,000. The properties, which were big producers in the days when Bolaños ranked as one of the most important districts of Mexico, now are owned by Americans. A favorable report was made by the Tonopah-Belmont engineer sent to examine the mines, but in view of the present situation in Mexico, it was concluded that it might be a long time before extensive operations could be carried on. The famous Bolaños group of mines, taken over three years ago by the Bradbury interests of Los Angeles, were shut down a few months ago because of rebel activity in that section of Mexico.

Rebels Recently Burned Eight Bridges on the Southern Pacific R.R. of Mexico in Sinaloa, putting a stop to railroad traffic in that state. For several months trains have been operated between Culiacan and Mazatlan and Mazatlan and Rosario, no attempt being made to operate north of Culiacan or south of Rosario. The bridges recently burned were between Culiacan and Rosario. The traffic interruption affected the big Minas del Tajo at Rosario. The rebel government of Sonora is operating the Southern Pacific line in that state. The only portion now being operated by the company is that in the state of Jalisco. A big shipment of machinery for the 250-ton reduction plant of the Cinco Minas company in the Hostotipaquillo district of Jalisco is being hauled from the Magdalena station to the camp. The shipment recently entered through the Pacific port of Manzanillo, and amounted to 14 carloads. Construction work is being rushed, and it is expected to have the plant in operation by the end of the year. The option on the Mezquital and San Carlos gold mines in the Mezquital del Oro district of Zacatecas, held by the Mezquital Mining Co. of Philadelphia, has been extended by the British interests owning them.

THE MINING NEWS

ALABAMA

Mobile County

U. S. STEEL CORPORATION, it is reported, has purchased property near Mobile involving the expenditure of $800,000. The corporation is to utilize the land thus purchased in connection with its Cuban iron-ore holdings.

ALASKA

THE KENAI RIVER VALLEY from the lower end of Kenai Lake to Skilak Lake, a distance of 20 miles, has been bonded and will be prospected. Representatives of B. L. Thane, general manager for the Alaska Gastineau Mining Co., of Juneau, are said to have been working on the deal since early spring prospecting, and negotiating for options, and now that all of the ground between the two lakes has been procured, a crew will be put to work at once. If the drilling tests confirm the surface prospects, it is planned to operate five large dredges on the Kenai River next summer. The work of prospecting the ground will cost $250,000 and will be done under the supervision of H. T. Tripp.

GOLD FROM THE SHUSHANNA, worth $3000, was brought to Dawson, Sept. 10, from James' properties. William James, Mrs. James and Nels Nelson, discovers of the camp, brought in the gold. They report the camp frozen for the winter. The first shipment of Shushanna gold has been made to the States and the assay showed fineness in gold to be about the same as the placer gold of the Nome district, or $18.22 per ounce, the Nome gold running $18.25. There is some silver and a little copper in the native metal, copper being found in all of the Copper River district gold. James brought down word that a new discovery had been made in the district, 20 miles from the original discovery, by George Pocin, of Seattle.

RICH PLACER GROUND has been found by Duncan McCormick on Alfred Creek, a tributary of Cariboo Creek, 120 miles from Knik. The strike was made in August, and McCormick and his partner Joe Palmer recently brought out 50 oz., all coarse dust. The discovery is claimed to have been made in a low, rolling country with plenty of water, and no timber. The pay is in schist. There is a good government trail the entire distance. The strike was made at the headwaters of the Netchina River, a tributary of the Tazline, which in turn empties into the Copper River. The U. S. Geological Survey Bull. No. 327, contains a report on the country. The gold field is about 4000 ft. above sea level, and, consequently, above the timber line. Reports from Knik state that about 200 prospectors have passed through that place on the way to the new strike.

ARIZONA

Maricopa County

A PLACER DEPOSIT NORTH OF PEORIA, on the Agua Fria, is being tested by drills. The claims are near the Relief mine.

A SHIPMENT OF HIGH-GRADE COPPER ore from the property of Charles Francis, west of Morristown, was recently made. Other shipments are to be made at an early date.

MAX DELTA (Phoenix)—Work is to be resumed at an early date.

RED ROVER (Phoenix)—Shipments of ore have been discontinued until the wagon road is repaired; a cloud-burst recently washed out the road near Camp Creek.

Mohave County

PIONEER (Vivian)—It is reported that good ore has been opened on the 200-ft. level. If the ore proves to be as extensive as anticipated, a mill in the district will be moved to this property.

KINGMAN COPPER CO (Mineral Park)—The second drill hole has reached a depth of 600 ft. and the third has been started. It is understood that the holes have shown the ground to be copper bearing, although no rich deposits have been encountered.

COPPEROSITY (Casa Grande)—Work at this property, in the Vekol district, has been begun. A contract has been let for 128 ft. of drift and 40 ft. of raise to connect Shaft No. 1 with the Daggs winze, sunk from the Dance Hall level. Other work is contemplated.

UNION BASIN MINING CO. (Golconda)—A 6-ton Saurer truck has just been received and is to be used to haul concentrates, ore and supplies between the mine and the railroad, four miles away. The new truck is provided with a hydraulic dumping attachment, which facilitates unloading.

BI-METAL (Kingman)—It is understood that this mine is to be opened up. There is already a small mill on the property, but the ore is low-grade and will require treatment of a large tonnage to make operations profitable. It is reported that the present mill is to be enlarged to about 300 tons daily capacity.

COPPER GIANT (Hackberry)—The first carload of ore has been shipped to the United Verde works, and it is expected that regular shipments will be made henceforth. The shaft has reached a depth of 300 ft. and drifts are being driven in the ore in both directions along the vein. At this depth the ore is said to be 9 ft. wide.

ARIZONA SOUTHWESTERN COPPER CO. (Copperville)—This company has recently ordered three 6-ton Saurer auto trucks, to be used for freighting between the mine and the railroad at Yucca. One of these trucks has just been received. After the new mill is started, the company expects to operate five trucks, the one which has been in use for the last year having given excellent service.

CALIFORNIA

Amador County

CENTRAL EUREKA (Sutter Creek)—Deepening the shaft is in progress. A drift has been started toward the South Eureka, which adjoins the south end line of the Central Eureka. It is expected to develop a 600-ft. oreshoot by this drift.

Humboldt County

BONNEVILLE (Blue Sky)—The main tunnel is in 400 ft. from the portal, and follows the vein. Development will be continued during the winter. The question of installing milling equipment will not be decided until next spring.

Inyo County

SKIDOO MINES CO. (Skidoo)—The new 10-stamp mill will run on company ore for the first month, then lessees' ore will be crushed by a steady run until all the ore now mined is cleaned up.

Mariposa County

MOUNT GAINES (Hornitos)—Three 8-hr. shifts are being worked in unwatering the shaft and preparing for extensive development.

COLORADO (Mariposa)—Peter Mulas, who claims this property under a homestead entry, has begun action just as the owners, Charles H. Weston and P. W. Judkiss, had begun building a stamp mill. The entry of Mulas is of recent date.

Nevada County

VICTOR MINING CO. (Nevada City)—This is a new incorporation, organized in Honolulu to develop and operate mining properties in Nevada County. W. G. Motley, of Nevada City, is vice-president and manager. The other officers are residents of Honolulu.

Plumas County

FOUR HILLS (Johnsville)—A small force of men is employed doing prospecting and repair work. The electric power house was badly damaged by a snowslide last winter.

MONITOR (Quincy)—This mine, formerly known as the Plumas National, at the head of Soda Creek, is under bond. Six men are employed in development. The property has 900 ft. of tunnel and prospects are good for resumption of production.

JUNE DAY MINING & MILLING CO. (Greenville)—The mine has recently been examined by Bert Strock, formerly superintendent of the Marysville Gold Dredging Co., at Marigold. It is believed that this district will be opened up and some producing mines developed.

San Bernardino County

BARSTOW GREEN MARBLE CO. (Barstow)—A cutting and polishing mill will be installed. The marble will be hauled by team from the quarries near Barstow.

San Diego County

MONTEZUMA (Warren Springs)—Twenty-five men are employed at this mine, which has been undergoing development for the last year. It is believed the mine will prove a profitable producer.

OWENS (Julian)—The 10-stamp mill is being overhauled and will be put in commission in the spring. The mill has been idle for five years. The mine is filled with water, but will be pumped out by the time the mill is ready. Good ore is said to have been produced in former operations.

Shasta County

SYBIL (French Gulch)—Litigation extending through a period of 15 years has been terminated by an agreement, which provides for a release of all claims to the property by the original owner, G. A. von Kruze, and for the sale by his daughter of certain interests. The Sybil Gold Mining Co. failed to pay the state license tax, but it is understood this will be settled and that the reopening of the mine will follow.

BALAKLALA CONSOLIDATED (Coram)—The installation of the Hall process on one Macdougal furnace is complete, except for the gas-manufacturing plant. An enlarged gas holder is still to be built, and other features of the gas plant are incomplete. Owing to the approach of the time limit of the option, which the Balaklala holds on this process, further negotiations are necessary looking toward an extension of time before actual tests can be continued.

Sierra County

SIERRA DEL ORO (Downieville)—A Nissen 1500-lb. stamp, with two concentrators, are being installed with gasoline-engine power. These will in time be replaced with machinery adequate to handle the large tonnage now being developed in this rehabilitated mine, in which several rich strikes have been made in the last year.

Tuolumne County

LONGFELLOW GOLD MINING CO. (Big Oak Flat)—This is a new incorporation, organized to take over the Longfellow mine. This mine produced a large amount of gold down to a depth of 500 ft. when a barren zone was encountered. No provision had been made by the owner for exploration and development and the mine was closed down. The present company has been advised by W. H. Storms, ex-state mineralogist, that the deepening of the shaft should develop as rich ore as was mined during the early operation.

COLORADO

El Paso County

UNITED STATES REDUCTION & REFINING CO. (Colorado City)—Recent sale of 20 shares of common stock at ⅜ represents a decline of ⅜ from previous sale and the lowest at which the stock has ever sold. The high figure, 44⅝, was reached Mar. 8, 1902. The company has not been operating its plants ior some time. Two of the plants were leased to Golden Cycle Mining Co., rent therefrom being only enough to pay fixed charges.

Las Animas County

DISORDER AMONG THE STRIKING COAL MINERS first occurred at Segundo, near Trinidad, Sept. 24, when Camp marshal Robert Lee was shot and killed. The shooting was done by a foreigner, name unknown, who, with two other foreigners, had been detected by Lee in the act of tearing up a small foot bridge. Lee was shot from his horse, the bullet striking him in the breast and penetrating a lung. The foreigners made their escape to the hills, with a posse in pursuit. A reward of $1000 has been offered for the capture of the men.

Park County

MOUNT BROSS MINING CO. (Alma)—The 50-ton concentrator and cyanide mill will be ready in October. The mill will derive its power from oil engines, which is somewhat of an innovation in this part of the county. A 32-hp. Fairbanks-Morse oil engine furnishes power for the grinding machinery, while a 12-hp. engine furnishes power for the Wilfley tables and for small dynamos for lighting the plant. The mine has ample resources opened up and a force of 25 miners will be put to work at once.

San Juan Region

BROWN MOUNTAIN SMELTER CO. (Ouray)—The furnace was blown in Sept. 26.

Teller County

GOLDEN CYCLE (Goldfield)—So far this year eight consecutive monthly dividends have been paid at the rate of 2c. per share, amounting to $240,000. For September, however, the dividend rate has been increased to 3c. per share, making the total amount paid this year, $285,000. The shaft is 700 ft. deep and all the working and properties are in good condition and making normal production. The main shaft is kept unwatered by electric pumps, as it was not affected by the deep-drainage tunnel. The Vindicator has a pumping agreement with the company, as its main shaft is also being drained by the Golden Cycle pumps.

IDAHO

Bonner County

LAWRENCE MINING & MILLING CO. (Clark's Fork)—Arrangements have been made to increase the scale of operations and to increase shipments from one to two cars of concentrates per month. A car containing 46 tons of concentrates was shipped to Murray, Utah, and returns amounted to $2251. The concentrate contained 71% lead and 14.6 oz. silver.

IDAHO-CONTINENTAL (Porthill)—It has been announced that shipments would begin not later than Jan. 1, 1914, and bids for a five-year ore-hauling contract have been advertised for. The contract will be awarded Oct. 10, and the successful bidder will be required to be ready to operate by Dec. 1. The output at first will be about 30 tons daily, but it is intended to increase this rapidly. Concentrator and other buildings will be under roof soon. The equipment for the 300-ton concentrator at the mine and the power plant at Boundary Creek, midway between the property and Porthill, is being installed and will be ready for a trial in a few weeks. The transmission line from the power station to the mine has been completed, and things are in such shape now that it is probable that operations will be commenced not later than Jan. 1.

Cœur d'Alene District

STEWART (Kellogg)—At a meeting held Sept. 30, the old board, with the exception of one man, was defeated for re-election, F. A. Heinze thereby losing some of his power in the affairs of the company.

MAHER AND HEARN (Burke)—Extensive underground development of these properties has been started by Eugene R. Day, of Spokane. A year ago Mr. Day, who is one of the owners and managers of the Hercules mine, bought a controlling interest in the Maher and Hearn, for a cash consideration generally reported as $40,000. The ground adjoins the Imperial property, in which Mr. Day is a stockholder. The Maher and Hearn ground is not incorporated, though the claims are patented. A long drift has been started from the lower workings of the Imperial, which will be carried into the adjoining property, giving good depth. It is estimated that from 600 to 900 ft. of work will have to be done before getting out of Imperial ground, and stockholders in this company are counting on this work to develop considerable of the Imperial orebody, especially as the drift is to follow along the course of the vein.

CARNEY COPPER CO. (Mullan)—Russell F. Collins, of Spokane, has entered into an arrangement with this company, whereby he is to take a bond on the property for two years at 3½c. per share net to the stockholders. He also has the privilege of purchasing within 60 days from Oct. 1, 600,000 shares of the stock of the company at the rate of 1½c. per share. Collins is to work 100 shifts per month at the mine during the life of the contract, which extends over a period of two years; 5% of the purchase price of 3½c. is to be paid in four months, 5% in 10 months, 15% in 15 months and 75% is two years. The Carney property is on the south side of Mullan near the "S" bridge on the Northern Pacific R.R., and is developed by two tunnels, the first of which shows an excellent shoot of copper pyrites. The lower tunnel has failed so far to open this shoot, and to locate this ore will be one of the first problems confronting Collins.

MICHIGAN

Iron

CASCADE MINING CO. (Palmer)—The Isabella shaft is now down 400 ft., and has yet to be sunk 500 ft. before drifting is started. Sinking has been in progress in a diorite dike for nearly a year.

AMERICAN (Diorite)—This mine, of the M. A. Hanna company, has been given a large increase in assessed valuation, due to recent discoveries of high-grade, soft ore in the lower levels. This old property, believed to have been exhausted years ago, is now in first-class condition, both as regards ore reserves and new equipment.

ZIMMERMAN (Iron River)—This property has been closed down and it will probably be some time before operations are resumed. There is considerable ore in stock and the management has not been very fortunate in making sales in the East. The property has had a varied experience and has been closed down a number of times since it was first opened.

SMITH (Gwinn)—The task of unwatering this property owned by the Cleveland-Cliffs Iron Co., was completed two weeks ago and men have been put to work putting the shaft in shape and clearing out the workings. The force will be gradually increased and it will not be many weeks before the mine will be producing ore. The Smith was closed down Dec. 1, 1911, when there was a general curtailment at all of the mines in the district.

CLEVELAND LAKE (Ishpeming)—A drift is being driven into the side hill at this property in order to intercept the present ventilating shaft, the object being to increase the draft in order to get better ventilation. The workings in this mine are extensive, and the air is quite warm, and often not very pure. The management is constantly making changes to better the working conditions.

ASHLAND (Ironwood—Orders were given by the Hayes brothers to reopen this mine, Oct. 1, so operations are again under way at the property. The mine was closed down in the spring because of the failure to dispose of the ore, but a large part of the stockpile has been shipped and the owners believe that they will experience little difficulty in disposing of the ore that will be stocked during the winter months. About 200 men are being employed.

AUSTIN (Gwinn)—The Cleveland-Cliffs company will soon cease work at this mine for some time, as there is considerable ore in stock and no market for it. The Stephenson, which was shut down two weeks ago, has 290,000 tons of ore in the piles, for which no market can be found. Preliminary work has again been commenced at the Gardner and Mackinaw, owned by the same company in the Gwinn district, where concrete shafts have been put down to the ore, but further sinking will have to be done and drifts driven to the deposits. It will be more than a year before these two properties will be ready to produce ore.

WAKEFIELD (Wakefield)—Butler Bros., the contractors, have commenced stripping a part of the Wakefield property for M. A. Hanna & Co., and it will require a long time to complete the work. The company is sinking two shafts; one has about reached the desired depth and the other will be down within a few weeks. The orebody is only 60 ft. from the surface at the deepest point, so it is safe to predict that ore will be shipped in 1914. An adjoining "40" will shortly be explored and the chances for getting ore there are excellent. The land is controlled by a party of Mesabi range men, while the Wakefield is leased by Selden Rose, of Marquette, to the Hanna company.

MINNESOTA

Cuyuna Range

PENNINGTON (Crosby)—A night shovel-crew has been employed. One shovel is working in ore and the other is stripping, in an 80-ft. section.

DULUTH-BRAINERD (Iron Mountain)—The shaft is 20 ft. deep and the headframe has been placed in position. The boiler has also been installed and the stack has been raised. It will not take this company long to get into the producing class.

PITTSBURGH STEEL ORE CO. (Riverton)—An order has been placed for two steam shovels, which will be put in operation as soon as the hydraulic stripping is completed. All of the overburden cannot be removed by hydraulicking and the shovels will have to dig the remainder.
mines.

CUYUNA-SULTANA IRON CO. (Brainerd)—A drill has been started on the McAlpine "40," which was recently secured. Much is expected of this property, which adjoins the Cuyuna-Mille Lacs on the east, and the Section 30 property on the south.

MESABI-CUYUNA IRON LAND CO. (Crosby)—Ore has been encountered by the drill which was started a short time ago near the center of the four "40's" at a depth of 90 ft. and was still in ore at 120 ft. The orebody on this property has proved to be the widest on the range, as it is known to be at least 1000 ft. wide. A hole will shortly be put down to the north to ascertain if the north and south orebodies are the same or separate.

MANGAN IRON & STEEL CO. (Crosby)—Good results have been obtained from the drilling on the Mangan No. 2 property, the ore having been shown to exist across the entire "40," east and west; it is of a high grade. The overburden averages only about 50 ft. and so it will probably be stripped and mined with steam shovels. No. 1 property disclosed some fine ore a short time ago and a mine will also be opened there.

DELL DEVELOPMENT CO (Aitkin)—The new Jones furnace will be ready for operation by Nov. 1. The management claims to have recently reduced manganiferous iron ore at their Iron Mountain, Mich., plant, with practically no loss of manganese. They have optioned and are now exploring several manganiferous iron properties on the Cuyuna range, with a view to reducing the ores at the Aitkin furnace now under construction. Due to failure of the process heretofore, mining men are skeptical of its success.

Mesabi Range

THE SOO LINE RAILWAY will build a steel and concrete ore dock on ground recently purchased at Ashland, Wis., according to reports. The new dock will connect with the present dock by trestle.

STOCKPILES at the Pioneer A, Pioneer B, Zenith and Sibley-Savoy shafts have been entirely cleaned up. Small stocks remain at the Savoy and the Sibley-Jura shafts, due to the low iron content of the ore. The Chandler has a fair-sized stockpile yet, but is making strenuous efforts to ship it all before the season closes. The cleaning up of all stockpiles on the eastern end of the Mesabi range insures great activity at Tower and Ely the coming winter.

THE ASSESSED VALUATION OF MINES and mineral lands in Minnesota, for purposes of taxation, will approximate $275,000,000 for 1913. Last year's assessments amounted to nearly $260,000,000. The 1913 assessment will approximate 40% of the total real-estate valuation in Minnesota. Seven years ago the assessed valuation of mines and mineral lands was but 14% of the total. The increased proportion is due to the activities of the state tax commission. No extraordinary increases were made, and the additional $15,000,000 represents a nominal increase of 5% throughout.

GREAT NORTHERN ORE CO. (Hibbing)—A contract has been awarded to the Foundation Co. of New York to sink a concrete shaft on Section 16, between Calumet and Marble, and the work has already been commenced. The New York company will also sink other shafts for the same company in that district. It was not long ago that compressed air was used in sinking the Morton and Scranton shafts through the overburden.

Vermilion Range

NORTH AMERICAN IRON MINING CO. (Tower Junction)—The officials of this company, a T. J. Walsh corporation, assert that blue hematite has been encountered at the 400 level, but not yet in large quantities.

NORTH AMERICAN STEEL & IRON CO. (Tower)—The drift being driven from the shaft to intersect the orebody has to go only about 40 ft. further. The drift passed through a large quantity of quartz porphyry, carrying gold from a few cents up to $200 per ton. The deposit is to the north of the iron-ore formation and it is believed that there is a considerable quantity of the gold-bearing material. As much of the deposit as has been disclosed has been examined by a number of geologists, who are of the opinion that a profit can be made by working the ore for gold in a small mill and the management may decide to build a mill after further developents have been made.

MISSOURI

Joplin District

R. L. MAGEE (Duenweg, Mo.)—Work on a modern concentrator is to begin soon.

BOGGESS-GIBSON (Thoms Station, Mo.)—A concentrator is to be built in a short time.

A NO. 1 (Joplin, Mo.)—This mine is to be reopened. Work of draining the ground now is in progress.

ATHLETIC (Webb City, Mo.)—Work of rebuilding the concentrator, destroyed by fire recently, will start soon.

ORNDUFF & CO. (Thoms Station, Mo.)—Additional equipment is to be installed to treat the ore from two shafts.

BALL & GUNNING (Lawton, Kan.)—A contract has been awarded for 1000 ft. of drilling. The company has a lease on 160 acres.

BIG THREE (Joplin, Mo.)—The concentrator and mine are in operation after being idle several months. The mine is to be known as the G. & F., in the future.

RED BIRD (Miami, Okla.)—The mill is being moved to the Gish lease on the Frosty Morning tract. It is of 150 tons capacity and is operated by the Lolita company.

COMMONWEALTH (Miami, Okla.)—A new company has taken over the mine and lease and soon will begin operations. The concentrator has been overhauled and placed in good condition.

IMPERIAL (Webb City, Mo.)—The concentrator was started recently and the company hopes to keep it in continuous operation. It is under new management, Weeks & Bigle of Webb City having assumed control.

MONTANA

Butte District

THE WASHOE SMELTER WILL BE CLOSED DOWN for two weeks, beginning Oct. 1, so that necessary repairs can be made. No repairs have been made on the large flue, nearly half a mile long, and which connects the smelting and converting plants with the main stack, since 1908. This will necessitate closing the smelting and converting plants for not to exceed 10 days. The concentrating department will not be closed and the mines at Butte will run as usual. The ore will be sent to the Great Falls smelter, and to the concentrator at Anaconda which will be kept running.

BUTTE-BALLAKLAVA (Butte)—The report of a settlement of the apex litigation of the Anaconda against the Butte-Ballaklava is denied by officers of the Anaconda.

PILOT-BUTTE (Butte)—A shoot of ore, assaying well in copper and silver, has been opened on the 2000-ft. level. The company has begun shipping ore to the smelters at the rate of about 50 tons per day.

RAINBOW (Butte)—The work of sinking the shaft is being carried on steadily at the rate of about 100 ft. per month, and a depth of 750 ft. has been reached. Crosscutting has been started on the 600-ft. level.

RAVEN (Butte)—Work on the lower levels of this mine has been stopped and the pumps have been hoisted, but mining is still being continued in a small way near the surface and some ore was recently shipped. There will probably be occasional shipments for some time to come.

CORBIN COPPER (Butte)—The shaft of the Gambrinus has reached a depth of 200 ft. Some plans for refinancing have been under consideration for some time but have not yet been announced. The assessment made under the reorganization and stock exchange plan has not brought in as much money as the management had hoped for.

BULLWHACKER (Butte)—The lease expired Sept. 25 and the company has taken the property over and will operate it. The overburden is being removed from a portion of the ore and the leaching plant is to be enlarged. President Clark claims that the company can, with the present system, produce copper at 7c. per lb. By a similar method the Butte & Duluth company has not yet been able to bring its copper cost much below 13c. per pound.

ANACONDA (Butte)—The main shaft at the Pennsylvania mine has been sunk three compartments wide, to the 2200-ft. level, where stations have been cut on both the north and south sides of the shaft. Crosscutting has been begun on the north. The electric pump on the 1800-ft. level has been remodeled to increase its capacity in order to handle the increased flow of water caused by the opening of the 2000- and 2200-ft. levels. A smaller, steam-operated pump has been installed on the 2000-ft. level, and this relays the water from that level and the one below, to the 1800-ft. level, from where it is pumped to the 1200-ft. level and transported by a flume through a crosscut driven for the purpose, to the Leonard mine pumps, about ¾ mile distant. Three to five carloads of waste are shipped from this property daily to be used at the Leonard mine for stope filling.

Broadwater County

KEYSTONE GOLD MINING CO. (Radersburg)—This company has been organized by Butte men to operate the Barnato group of claims comprising about 100 acres between the Keating and Ohio-Keating mines. Two or more veins have been opened by surface cuts and tunnels, and considerable gold ore has been shipped from near the surface of the Keystone vein. The new company intends to continue sinking the two-compartment shaft from its present depth of 280 ft. to the 500-ft. level and develop the property at that depth.

Fergus County

BARNES-KING (Kendall)—It is reported that the directors have decided to take over the Piegan-Gloster gold properties in the Marysville district, which the company had had under bond some time.

Madison County

GOLD DREDGING OPTIONS are being sought, it is rumored, on bottom lands between Twin Bridges and Iron Rod. It is believed that placer gold exists in the gravels of this district at considerable depth, and the men behind the movement intend, in case the options can be secured, to thoroughly prospect the ground with drills.

MISSOURI (Virginia City)—The Elling brothers of Virginia City, who recently purchased two claims on north Meadow Creek, have organized the Missouri Mining Co., and begun operations there with a force of six men. Development work only will be done during the autumn and winter, and if sufficient ore is opened to warrant the expenditure, a mill will be built. Several new buildings have been built and a wagon road graded to the property.

NEVADA

Comstock Lode

PRODUCTION ON THE COMSTOCK LODE for the six months ended June 30, 1913, was 60,259 tons, the gross bullion yield being $624,210. The following mines produced tonnage and bullion yield as shown by the figures: Mexican, 10,058 tons yielded $246,307; Ophir, 11,045 tons yielded $108,068; Chollar (lease), 18,456 tons yielded $114,505; Crown Point, 8192 tons yielded $48,586; Comstock-Phoenix, 1812 tons yielded $33,762; Monte Cristo (lease), 5536 tons yielded $56,395; Belcher, 1914 tons yielded $7288; Hale & Norcross (lease), 322 tons yielded $4800; Yellow Jacket, 2924 tons yielded $4499; total, 60,259 tons milled and $624,210 total bullion yield.

Clark County

HOWARD MINES CO. (Goodsprings)—This company was recently incorporated to take over the Singer group. A force of men is now engaged in building a 50-ton mill on the property to treat the low-grade lead ore, a considerable quantity of which is blocked out. The Stebbins dry concentrator will be installed, it already having proved successful in treating this class of material at the Hoosier mine.

Eureka County

U. S. SMELTING VS. NEVADA-EUREKA R.R.—John M. Marble, of the Interstate Commerce Commission, has completed the hearing in this case. The railroad line taps the Richmond-Eureka mine at Eureka, and the United States company seeks to have the rates on ore reduced to the level that existed previous to the washout on this line over three years ago. The Nevada railroad commission has ordered this company to reconstruct its line to the Ruby Hill mine, recently torn up because the railroad company claimed that the traffic did not pay operating expenses. Commissioner Marble will present the case to the full commission in Washington.

Humboldt County

BUCKSKIN-NATIONAL (National)—New bunk houses are being erected.

EASTERN STAR (Gold Circle)—A mill, it is stated, may be built next spring.

LASHER MILL (Kennedy)—This plant was partially destroyed recently by a severe cloudburst.

Lyon County

YERINGTON MOUNTAIN (Yerington)—Regular shipments are being made, and will be increased in the near future. Development on the lower level is progressing with satisfactory results.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Sept. 18, 1913, were as follows: From Mason Valley mine, 2216 tons; from Nevada-Douglas, 925 tons; from other mines 965 tons; total 4106, or a daily average of 586 tons. During the same week four cars of matte were shipped.

Mineral County

TENNESSEE (Mina)—This mine was sold recently, bringing, it is reported, $50,000.

SILVERFIELD (Mina)—The new 25-hp. hoist has been installed, so now shaft sinking has been resumed. The inclined shaft is now 225 ft. deep, and is in ore most of the distance.

PINE GROVE MINES CO. (Pine Grove)—The power line extension from the Bluestone substation is rapidly nearing completion and will be ready to supply power when the mill is finished. A drainage tunnel is being driven to unwater a greater portion of the mine.

Nye County

VERDE (Manhattan)—Placer mining is being done on this property by lessees. A shaker, elevator and sluice boxes will be installed.

NEVADA CINNABAR CO. (Ione)—Brick for the new furnaces has been received, and it is expected that the furnaces will be in operation within 60 days.

BIG FOUR (Manhattan)—About 110 tons per day are being treated in the mill. Recent changes in the flowsheet and size of the plates have increased the saving and the capacity of the plant.

RILEY FRACTION (Manhattan)—The glory hole workings are producing an average of 115 tons per day. The ore is churn drilled and broken by large blasts. It is reported that an electric shovel will be installed for mining this large shoot.

NEW MEXICO

Santa Fé County

SANTA FE GOLD & COPPER MINING CO. (Santa Fé)—Operations are to be resumed on the ore now available. New blowers are to be installed and the smelter will be blown in. Further development work may be done. The ore contains 2 and 3% copper and a large tonnage is blocked out. The second-class ore, containing 2% copper, was formerly milled prior to smelting; matte containing 60% copper was shipped to New Jersey refiners.

Socorro County

MAUD MINING CO. (Mogollon)—Installation of compressor plant was completed last week and machine drills are now used underground.

ERNESTINE (Mogollon)—The crushing capacity of mill was recently increased from 100 to 160 tons per day. Another oreshoot has been cut in sinking the main shaft.

MOGOLLON (Mogollon)—The Little Charlie mine, operated by a Los Angeles firm under lease and bond, has recently been shipping 50 tons per day, by burros, to one of local custom mills.

SOCORRO (Mogollon)—Approximately 1¼ tons of gold and silver bullion were consigned to the mint week before last, being the cleanup for first half of September. Several tons of rich concentrates were also shipped to smelter.

TREASURE MINING & REDUCTION CO. (Mogollon)—After being idle several months, work was resumed in mine on Sept. 21. A proposition is being considered for hauling ore to the mill, three miles distant from the mines, by motor truck instead of wagon, as formerly. An aërial tramway may eventually be installed.

UTAH

Beaver County

MAJESTIC (Milford)—Good progress is being made in sinking the Hoosier Boy shaft.

HORN SILVER (Frisco)—About four cars per week are being shipped from the old slag dumps.

SOUTH UTAH MINES & SMELTERS (Newhouse)—During August, the production was 230,410 lb. copper, on which a slight profit was made. Ore milled during the last few months averaged approximately 1.45% copper, and a 65% recovery was secured in milling. The output thus far in 1913 has amounted to 902,150 lb. copper, exclusive of January, February and March, when the property was closed. The annual meeting will be held Oct. 20.

Salt Lake County

MICHIGAN-UTAH (Alta)—Shipments via the tramway, which has been out of commission will soon be resumed. A good tonnage is reported to be available.

BINGHAM-NEW HAVEN (Bingham)—Checks have been mailed to stockholders for the recently declared dividend of 10c. per share. The total distribution is $22,869, making the total to date $457,378. The last dividend of 10c. per share was paid July 12, 1912.

UTAH APEX (Bingham)—A new contract has been made with the American Smelting & Refining Co., by which 300 tons of ore or more can be marketed daily. This will allow greater output and earnings. It is stated that the company will be in a position to start dividend payments next year. Earnings of $40,000 per month are possible under the new arrangements. A party of Eastern stockholders visited the property Sept. 22. The Utah Apex has a large amount of ore developed, and ore in excess of that contracted for may be shipped to another smeltery.

Summit County

SILVER KING CONSOLIDATED (Park City)—The McIlwee contract in sinking the main three-compartment shaft is expected to be completed by Oct. 10.

ONTARIO (Park City)—A strike on the 1500 level is reported. Drifting has been in progress for several months to reach this ore, which may open into something important.

DALY-WEST (Park City)—On the 900- and 1700-ft. levels new ore is being opened and conditions are reported to be very promising. A substantial tonnage is indicated on the 1700.

Washington County

THE NEW GOLD CAMP IN BULL VALLEY is being visited by Salt Lake men. Ore carrying gold has been followed over 100 ft. in one of the tunnels. High-grade specimen ore has been obtained.

WASHINGTON

Ferry County

SAN POIL (Republic)—A gold brick valued at $5667 was recently shipped from this mine, representing the first cleanup since the installation of the new engines.

MOUNTAIN LION (Republic)—Operations are to be resumed in the near future. An examination of the property has recently been made and the company is considering the installation of a cyanide plant.

Stevens County

BIG BEAR (Marcus)—A double shift of men is to be put on the eight claims owned by this company, driving a crosscut tunnel.

WISCONSIN

Platteville District

BULL MOOSE (Benton)—Shaft sinking completed, a 100-ton concentrator will be built.

SANS SOUCI (Benton)—A new mill is to be built to replace the plant recently lost by fire.

WILKINSON (Benton)—Shipments of two to three cars of high-grade lump pyrites are made daily.

LAWRENCE (Hazel Green)—The new plant is about completed and shipments will be started shortly.

SAINT ROSE (Platteville)—The old tailing pile is being remilled. There are now only two producers at Platteville.

WINSKELL (Shullsburg)—This mine continues to be the heaviest shipper in the district averaging one car of concentrate per day.

NEW JERSEY ZINC CO. (Galena)—Plans are being completed for making the old Black Jack mine one of the largest producers in the district.

CLEVELAND (Hazel Green)—Heavy shipments are being made from mine No. 1 and arrangements are being made to develop the Scrabble Creek mine. The Square Deal and Murphy properties are also being prospected.

CANADA

Baffin's Land

NO GOLD HAS BEEN DISCOVERED in Baffin's Land, according to Capt. Joseph E. Bernier, the Arctic explorer, who has just returned from the North. The report that such a discovery had been made, was made to the Government by the second mate of the steamer "Arctic."

British Columbia

THE HIDDEN CREEK SMELTER of the Granby company may be in shape for operation early in January, 1914. The daily capacity of the plant is to be 2000 tons.

Ontario

PORCQUOIS, a combination of Porcupine and Iroquois, is the new sign that will appear on the Iroquois Falls station and in the new timetable of the Timiskaming & Northern Ontario Ry.

LA ROSE (Cobalt)—The regular quarterly dividend of 2½% payable Oct. 20 has been declared.

NIPISSING (Cobalt)—The regular quarterly dividend amounting to 7½% payable Oct. 20 has been declared.

HOLLINGER RESERVE (Timmins)—The Lewisohn interests have paid over the first installment of $20,000 on the purchase money for this property.

WISHMAN (Swastika)—These properties have been purchased by English interests and the company known as the Telluride Gold Mines, Ltd., will be formed to operate them.

CITY OF COBALT (Cobalt)—A special meeting was called for Oct. 1 to ratify a by-law increasing the capital from $1,500,000 to $2,100,000. The purpose for which this extra money is to be used has not been stated.

HOLLINGER (Timmins)—Stopes on the 300-ft. level are being timbered and a considerable tonnage can shortly be expected from these workings. Good progress is being made with the construction work for the additional 20 stamps.

KERR LAKE (Cobalt)—The annual report for the year ended Aug. 31, shows a total income of $1,182,493 and a surplus of $237,315 after paying dividends. The output of silver was 2,109,975 oz. and the ore reserves were approximately estimated at 6,000,000 oz.

HUDSON BAY (Cobalt)—The production for August amounted to $73,150. The holding company known as the Hudson Bay Mines, Ltd., has declared a dividend of 2½% which with the cash on hand, will permit the operating company to pay three dividends of 300%.

WETTLAUFER (South Lorrain)—The continuance of operations at this mine depends on the result of extensive diamond drilling work which is being undertaken and will be carried on until December in the hope of finding profitable ore. Practically the entire area will be prospected. So far the results have not been encouraging. A dividend of 5% payable Oct. 22 has been declared.

CANADIAN MINING & EXPLORATION CO.—This company has examined and rejected 700 properties in the United States and Canada to date. It was organized 18 months ago, with the primary object of investigation and exploration of Canadian mining resources but has not confined its attentions to Canadian properties only. The first report covering operations to the beginning of this year showed that 400 properties had been investigated and declined.

Yukon Territory

YUKON GOLD CO. (Dawson)—Employees at Lovett Hill, three miles from Dawson, were held up, gagged, bound and thrown into a ditch by two armed men, who then robbed the sluice boxes, obtaining $20,000. The annual cleanup was to have been made Oct. 1. The holdup was made Sept. 29.

PORTUGAL

ALLUVIAL TIN is reported to have been discovered near Guarda, close to the Spanish frontier. An American company is preparing to operate on a large scale.

THE MARKET REPORT

METAL MARKETS

NEW YORK—Oct. 1

The metal markets have shown generally a fair degree of activity, prices remaining variable. There is, apparently, a strong undertone.

Copper, Tin, Lead and Zinc

Copper—The last week has been one of the dullest, if not the dullest, of record this year. The electrolytic market has been made wholly by the traders and one or two small producers. They have sold copper as low as 16¼c., cash, New York, and copper has been offered from several quarters at 16⅜@16½c., delivered, 30 days. Some small sales to Europe were made at 16½c. All of these terms correspond to about 16.25@16.30, cash, New York. In the meanwhile the large producers have maintained their old asking price of 16⅞c., delivered, usual terms, and although making no sales have been entirely unconcerned, confident in the opinion that the market is speedily coming back to them. The sharp advance in the London market on Oct. 1 stimulated some inquiry and created a more hopeful feeling in the offices where but little business has been done for three weeks previous.

The producers are well sold up for October and consumers are thought also to be well covered for that month. It is believed that a good deal of the November requirements remain yet to be placed. Some December copper has been ordered, but so far not very much.

The Lake market remains the same as we reported last week, and quotations are scarcely more than nominal. In this kind of metal a natural corner substantially exists. However, there are a few carloads available here and there, and an occasional carload lot was sold at 16¾c. during the last week.

The history of the week may be summed up in the statement that buyers have continued to hold aloof and producers have not been pressing sales. Meanwhile, the statistical position of the metal has still further improved owing to the continued diminution of the visible supply abroad. The prevailing opinion in the trade is that as soon as any important demand makes itself felt prices are likely to be immediately affected upward.

At the close Lake copper is quoted at 16¾@17c., and electrolytic copper in cakes, wirebars and ingots at 16.25@16.35c., while casting copper is quoted nominally at 16.10@16.15c. as an average for the week.

The London market for standard copper has been dull and has fluctuated within narrow limits at around £72 5s.@£72 10s. for spot and about 2s. 6d. less for three months. On Wednesday, Oct. 1, however, when the statistics for September appeared, speculators began to take an interest again and a good business was done at advancing prices. The market closes at £74 for spot and £73 15s. for three months.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17¾@18c., carload lots at mill.

Exports of copper from New York for the week were 6602 long tons. Our special correspondent gives the exports from Baltimore at 1286 tons for the week.

Tin—While there was a fair business with consumers the middle of last week, this has subsided, due to the declining London market and the anxiety shown by dealers in anticipation of poor statistics to market the metal at concessions from the foreign price. The statistics which were published on the first of this month turned out even worse than expected, and had a rather depressing influence on sentiment.

There seems hardly any doubt that consumption in this country has fallen off and the decreased requirements of the tinplate mills, of which rumors were current all along, are a fact. The close is somewhat better at £187 15s. for spot, and £187 15s. for three months, and about 41c. in this market.

Lead—Lead has been freely offered at lower prices, and there does not appear to be enough demand to readily take care of the metal which is pressed for sale. On the afternoon of Oct. 1 the American Smelting & Refining Co. reduced its quotations to the extent of $3 per ton, and the close is weak at 4.40@4.45c., St. Louis, and 4.55@4.60c. New York.

The London market for Spanish lead closes at £20 12s. 6d., and English £1 higher.

Spelter—This market too, is quiet and lower, and consumers continue to hold off. At the close it is quoted at 5.35@5.40c., St. Louis, and 5.50@5.55c., New York.

Good ordinary spelter in London is quoted at £20 17s. 6d., and specials 12s. 6d. higher.

Base price of zinc sheets is now $8 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

Cadmium—German quotation is 750 marks per 100 kg., f.o.b. works in Silesia. This is equal to about 81c. per lb. at works.

Selenium—For large lots, 100 lb. or over, $3@3.25 per lb. is quoted; while $5 is paid for retail orders.

DAILY PRICES OF METALS

NEW YORK

Sept.-Oct.	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
25	4.8560	61⅛	*16¾ @17	16.30 @16.35	42¼	4.60 @4.65	4.45 @4.50	5.55 @5.60	5.40 @5.45
26	4.8560	61⅞	*16¾ @17	16.25 @16.30	41¾	4.60 @4.65	4 45 @4.50	5.50 @5.60	5.35 @5.45
27	4.8545	62	*16¾ @17	16.25 @16.30	41¾	4.60 @4.62½	4.45 @4.47½	5.50 @5.55	5.35 @5.40
29	4.8530	61¾	*16¾ @17	16.25 @16.30	41⅝	4.60 @4.62½	4.45 @4.47½	5.50 @5.55	5.35 @5.40
30	4.8555	61¼	*16¾ @17	16.25 @16.30	41½	4.60 @4.62½	4.45 @4.47½	5.50 @5.55	5.35 @5.40
1	4.8560	61⅜	*16¾ @17	16.25 @16.35	41	4.57½ @4.62½	4.42½ @4.47½	5.50 @5.55	5 30 @5.40

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Sept. Oct.	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
25	28 7/16	72⅜	72⅝	79	192	192¾	20⅜	20¾
26	28 9/16	72¼	72½	78¾	190	190½	20	21
27	28⅝	....	....	....	....	....	....	....
29	28½	72½	72⅜	78½	189¾	190¼	19⅝	21
30	28 5/16	72⅜	72½	78½	188	188¼	20¼	20⅜
1	28 5/16	74	73¼	79½	187½	187¾	20⅜	20⅜

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

Other Metals

Aluminum—The tariff bill has finally passed putting the duty at 2c. per lb. on ingots. Business has been quiet, but promises to improve. Quotations are a little unsettled at 20@20½c. per lb. for No. 1 ingots, New York.

Antimony—Business is rather quiet at present and prices are unchanged, Cookson's is 8.25@8.50c. per lb.; Hallett's 7.75@8c.; while 7.25@7.50c. is asked for Chinese, Hungarian and other outside brands. Wtih the settlement of the tariff question an improvement in business is looked for.

Quicksilver—Business is quiet. The New York quotation has been reduced slightly and is now $38.50 per flask of 75 lb. San Francisco, $38.50 for domestic and $36 for export. London price is unchanged at £7 5s. per flask, with £7 named by second hands.

Bismuth—Quotations at New York are $1.72 per lb. for metal produced from domestic ores; $1.80 for imported metal. London quotation is 7s. 6d. per lb. The price is controlled by the European syndicate.

Magnesium—Current price of pure metal is $1.50 per lb. for 100-lb. lots, New York.

Nickel—Quotations for ordinary forms, shot, blocks or plaquettes are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

Gold, Silver and Platinum

Gold on the open market in London remained at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. A total of £190,000 was taken for India and £1,100,000 for Egypt.

Exports of gold from New York week ended Sept. 27 were only $350. Imports were $640,591, chiefly from Cuba and Mexico.

Imports of gold in France in the seven months ended July 31 were 357,528,000 fr.; exports, 47,616,000 fr.; excess of imports, 309,912,000 fr., an increase of 163,366,000 fr. over last year.

Sales of gold bars from the New York Assay Office in August were $2,627,491, largely for use in the arts. For the eight months ended Aug. 31 the total sales were $18,730,651 in 1912, and 021,806,279 in 1913; an increase of $3,075,628 this year.

Iridium—There is nothing new to report. Prices are $83@85 per oz., New York.

Platinum—The market is still unsteady. Dealers hold for $45 per oz., but actual sales of metal have been made at $43@44 per oz., and it is said that plenty can be had at those figures.

Silver—The market demands for silver bullion at 28¾d. having been satisfied the price has receded to 28 $\frac{7}{16}$d. in London. It is reported that the India mint has been a purchaser, and as the crop situation in that country is regarded as very favorable, it is likely that present rates will be maintained.

Shipments of silver from London to the East, Jan. 1 to Sept. 18, as reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India	£7,365,700	£5,148,500	D. £2,217,200
China	933,500	592,000	D. 341,500
Total	£8,299,200	£5,740,500	D.£2,558,700

Imports of silver at New York, week ended Sept. 27, were $152,709, from Central and South America. Exports were $1,245,669, chiefly to London and Paris.

Zinc and Lead Ore Markets

JOPLIN, MO.—Sept. 27

The high price of zinc blende is $49, the base per ton of 60% zinc $43@47 for choice grades. Prices at the week-end were stronger and the demand increased for all grades. Several purchases of stock were made Friday at a $46 base for grades offered only $44@45 earlier in the week. Calamine sold on a base of $21@23, with a few choice lots at a $24 per ton of 40% zinc. The average of all grades is $42.88 per ton. Lead is stronger, selling as high as $60.50 per ton on a base price of $58 per ton of 80% metal contents. The average of all grades is $56.12 per ton.

SHIPMENTS WEEK ENDED SEPT. 27

	Blende	Calamine	Lead	Value
Totals this week	10,585,760	847,640	2,235,310	$307,900
Totals 9 months	418,490,810	31,421,110	69,557,750	$11,678,499

Blende value, the week, $234,222; 9 months, $9,419,011.

Calamine value, the week, $10,938; 9 months, $405,059.

Lead value, the week, $62,740; 9 months, $1,854,429.

PLATTEVILLE, WIS.—Sept. 27

The base price paid this week for 60% zinc ore was $45@46 per ton. The base price for 80% lead ore was $56@57 per ton.

SHIPMENTS WEEK ENDED SEPT 27

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,226,170	64,900	1,122,940
Year to date	11,619,870	5,231,190	44,030,850

Shipped during week to separating plans, 2,674,850 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Sept. 24

Throughout the iron and steel industry buyers display a waiting attitude, doubtless due in part to the fact that the long discussed tariff bill is now finally being enacted into law, and partly to realization of the fact that the steel mills are now reaching the end of their accumulation of orders and may soon name lower prices.

Thus far there has been little definite restriction of steel output, but the majority of mills are operating under less pressure, and actual tonnages turned out are probably 5 to 10% less than 30 days ago.

The most active lines are wire products, in which specifications are 50 to 100% heavier than in August, due to the season, and tubular goods, in which specifications are substantially as heavy as in August. In all other lines there have been decreases. In sheets the decrease is least marked, additional business being brought out by lower prices lately named. In structural shapes there remains a large amount of unfilled specifications, and some mills are still about three months behind.

In general, the price situation shows little change from a week ago. The reduced pressure upon the mills, due partly to their catching up on old business and partly to the decrease in specifications in the past two weeks, enables them to make prompt deliveries on new business in nearly all branches, structural shapes being an exception, and thus the mills are somewhat more ready to shade prices, but there is no rush to do so. Probably the idea of the mills in that they can well acord to have a period of a few months of curtailed production, before they make any strong bid for business. It is clear that no large amount of new business could be developed at this time by price cutting. Reductions now would only encourage buyers to wait for further cuts. The tariff, moreover, while it suggests lower prices in a general way, presents a complicated problem, as the competition will be much keener on some products than on others.

The Pennsylvania R.R. Co., it is reported, is negotiating a sale of the stocks it holds in the Cambria and the Pennsylvania Steel companies, but nothing has been made public. The company is also preparing to sell its interest in several anthracite companies.

PITTSBURGH—Sept. 30

While the steel mills are operating under somewhat less pressure, and actual tonnage output is thereby reduced a few per cent., there are no definite closings and it is hardly likely there will be any within a week or two. A continuance of present market conditions, however, would probably bring the steel industry down to working at 60 or 70% of capacity by some time in November.

In new business the brightest spot is steel passenger train cars, for which relatively large orders are being placed. Buying of freight cars is expected soon.

Pig Iron—The market continues absolutely stagnant. Sales are infrequent and cover only small tonnages. Occasional inquiry brings out prices substantially the same as formerly quoted. The local market has not declined thus far, but the expectations entertained by furnaces two or three weeks ago that advances would occur have been dissipated, at least until the market becomes much more active. We quote: Bessemer, $15.75@16; basic, $14; No. 2 foundry, $14; malleable, $14.25; forge, $13.50, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—Late last week the English pool made a reduction of $3.50 in its regular price on ferromanganese, from $56 to $52.50, Baltimore, subject to the old duty, which would make $50 under the new duty. The continued shading of the old price had presaged a drop, but the reduction proves to be $3.50 instead of the $2.50 expected. The mar-

ket continues quiet. We quote prompt and forward, subject to the new tariff admitting ferromanganese free, at $50, Baltimore, with $2.16 freight to Pittsburgh.

Steel—The market has grown visibly softer but is too inactive to enable prices to be quoted accurately. We quote billets at $24 and sheet bars at $25, either bessemer or open-hearth, f.o.b. maker's mill, Pittsburgh or Youngstown. These quotations are $1 a ton lower than named last week, but probably do not represent the lowest that could be done on an interesting inquiry. Rods are nominally $27, Pittsburgh or Youngstown, with no activity.

IRON ORE

Ore boats on the Lakes have been delayed by stormy weather. It is thought, however, that all the Lake ore still to come down can be handled by the contract vessels, and no wild boats are required to help out.

The Interstate Commerce Commission has authorized the Pennsylvania Co. to reduce its ore rate from Lake Erie ports to the Wheeling District from 88c. to 70c., to meet a rate made by the Wheeling & Lake Erie R.R. The order is temporary, pending the further investigation of the whole question of rates on iron ore from the Lake ports.

COKE

Connellsville Coke—The market is the most complicated yet seen. The regulars adhere to their $2.50 price on furnace coke, while some outsiders are offering coke at lower figures, but neither party seems to make any sales, despite the fact that by this time there should have been developed considerable demand for October. One sale of about 6000 tons, delivery to the end of October, has been made at the full price of $2.50. While the trend of events has seemed to make the position of the regulars less secure, they seem to have scored a strong point, for this week the Producers' Coke Co., which acts as the exclusive agent of the regulars, announces a fresh list of operators for whom it acts. The Producers' Coke Co. states that the companies it now represents produce 3,500,000 tons of coke annually.

Exports and Imports of Fuel in the United States seven months ended July 31, long tons:

	Exports		Imports	
	1912	1913	1912	1913
Anthracite	1,615,892	2,448,913	30	30
Bituminous	8,077,177	10,008,012	869,403	826,784
Coke	479,434	550,751	47,790	39,698
Bunker coal	4,319,514	4,291,801	.....	.....
Totals	14,522,017	15,299,477	917,223	866,512

The bunker coal or coal furnished to steamships in foreign trade is practically all bituminous. The larger part of the trade, both exports and imports, is with Canada.

Coal Production in Germany seven months ended July 31, in metric tons:

	1912	1913		Changes
Coal	94,956,795	104,862,722	I	9,905,927
Brown coal	37,168,878	39,854,052	I	2,685,174
Total mined	132,125,673	144,716,774	I	12,591,101
Coke made	16,166,998	18,671,317	I	2,504,319
Briquettes made	13,710,896	15,612,860	I	1,901,964

Of the briquettes reported this year 12,209,736 tons were made of brown coal or lignite.

CHEMICALS

NEW YORK—Oct. 1

The general market is still active and improving, and a good quantity of business is reported.

Imports and Exports of Chemicals and raw materials in the United States, seven months ended July 31, were as follows:

	Imports		Exports	
	1912	1913	1912	1913
Arsenic, lb	2,983,425	4,880,388	.....	66,000
Copper sulphate, lb	.....	.....	5,504,879	3,481,639
Bleach, lb	41,520,981	40,615,405	400	13,260
Potash salts, lb	374,784,340	338,008,688	1,710,625	7,370,217
Soda salts, lb	7,187,205	7,515,014	300,808	238,960
Acetate of lime, lb	.....	.....	45,777,383	47,081,364
Nitrate of soda, tons	310,504	411,947	6,034	3,546
Sulph. of ammonia, tons	25,250	31,031	160	.....
Phosphates, tons	.....	.....	702,767	801,951
Sulphur, tons	15,377	4,514	24,962	52,214
Pyrites, tons	555,059	539,191	.....	.....
Magnesite, tons	57,481	96,875	593	607
Chrome ore, tons	31,566	35,559	.....	.....

Exports include reëxports of foreign material. Some phosphate is imported, but it is not given separately in the returns.

Arsenic—The market remains dull. Quotations are $3@3.25 per 100 lb. and are rather nominal.

Copper Sulphate—Business is good. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

Nitrate of Soda—The preparations for spring trade have not begun yet and the market is dull. The quotations are 2.40c. per lb. for both spot and futures.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	April	May	June	July	August
Alaska shipments	1,730,252	1,771,508	2,203,191	2,705,136	1,847,785
Anaconda	23,800,000	25,600,000	21,500,000	22,100,000	22,500,000
Arizona, Ltd	3,100,000	3,200,000	3,000,000	2,600,000	1,800,000
Copper Queen	8,210,166	8,301,605	7,477,936	8,369,607	8,252,404
Calumet & Ariz.	4,500,000	4,300,000	4,000,000	3,800,000	4,500,000
Chino	3,925,409	3,883,611	3,682,706	4,831,185	6,050,867
Detroit	1,856,517	2,001,633	1,750,601	1,549,224	2,187,223
East Butte	1,400,000	1,268,595	1,055,646	1,060,257	.....
Mammoth	1,450,000	1,700,000	1,750,000	1,800,000	1,750,000
Giroux*	600,000	625,000	610,000	610,000	.....
Mason Valley	1,264,304	1,186,560	1,097,014	908,892	867,060
Miami	.....	1,943,900	2,612,000	.....	.....
Nevada Con.	5,650,000	5,93[illegible],275	6,344,863	5,403,919	.....
Ohio	690,001	65[illegible],071	537,400	601,700	.....
Old Dominion	3,040,000	2,74[illegible],000	2,511,000	2,526,000	2,524,000
Ray	4,379,128	4,384,100	4,392,612	4,097,000	4,269,519
Shannon	1,238,000	1,080,000	924,000	880,000	1,248,000
South Utah	132,267	200,000	185,000	140,000	223,498
Tennessee	1,718,188	$1,037,115	1,379,220	1,247,804	.....
United Verde*	3,000,000	3,000,000	2,900,000	3,000,000	.....
Utah Copper Co.	9,539,847	10,003,227	11,637,949	9,849,043	10,302,251
Lake Superior*	17,000,000	18,705,000	16,500,000	17,500,000	9,700,000
Non-rep. mines*	6,000,000	6,300,000	6,000,000	6,200,000	.....
Total prod.	104,224,079	109,824,500	104,051,138	101,758,167	.....
Imports, bars, etc.	25,578,297	22,205,942	18,255,267	29,029,990	.....
Total blister	129,802,376	132,030,442	122,306,405	130,788,157	.....
Imp. ore & matte	7,177,363	10,528,562	7,497,002	8,527,046	.....
Total Amer.	136,979,739	142,559,004	129,803,407	139,315,203	.....
Miami†	2,312,900	.....	.....	2,890,000	3,097,500
Shattuck-Arizona	1,158,326	1,026,170	1,059,625	1,019,388	1,001,634
Brit. Col. Cos:					
British Col. Cop.	794,000	618,076	634,238	618,379	.....
Granby	1,857,452	1,782,570	1,789,000	1,664,102	1,847,344
Mexican Cos.:					
Boleo†	2,811,200	2,424,800	1,984,640	2,240,720	2,264,640
Cananea	3,581,690	2,272,000	2,908,000	3,328,000	3,186,000
Moctezuma	2,753,240	2,695,881	3,438,793	2,693,006	3,542,047
Other Foreign:					
Braden, Chile	1,512,000	1,150,000	1,804,000	1,046,000	1,572,000
Cape Cop., S. Af.	586,880	387,520	414,400	.....	.....
Kyshtim, Russia	2,544,640	1,490,000	1,000,000	2,500,000	.....
Spassky, Russia	974,400	721,280	835,520	660,800	1,048,320
Exports from					
Chile	7,616,000	3,584,000	5,824,000	9,856,000	8,736,000
Australia	6,608,000	7,840,000	7,616,000	10,304,000	6,720,000
Arrivals-Europe†	10,545,920	13,661,760	5,277,440	11,728,640	14,624,960

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

STATISTICS OF COPPER

Month	United States			Visible Stocks.		
	U.S. Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
IX, '12	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I, 1913	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI	121,860,853	68,362,571	68,067,901	67,474,225	77,235,200	144,709,425
VII	138,074,602	58,904,192	78,480,071	52,814,606	71,904,000	124,808,606
VIII	131,632,362	73,649,801	73,263,469	53,594,945	66,420,480	120,015,385
IX	.....	.....	.....	38,314,037	63,716,800	102,030,837
X	.....	.....	.....	.....	.....	.....

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq.	Sale	Amt.
Alpha Con., Nev.	Sept. 22	Oct. 15	$0.02
American, Utah	Sept. 18	Oct. 18	1.00
Belmont, Ida.	Sept. 30	Oct. 10	0.0025
Big Flat Hydraulic, Mich.	Sept. 22	Oct. 7	0.05
Confidence, Nev.	Sept. 23	Oct. 14	0.10
Copper King, Ida.	Sept. 14	Oct. 14	0.01
Emerald, Utah (3d install.)	Sept. 15	Oct. 11	0.005
Emma, Utah	Sept. 19	Oct. 18	0.005
Gold Hill, Ida.	Sept. 10	Sept. 30	0.0005
Great Western Con., Nev.	Sept. 15	Oct. 9	0.01
Hamburg-American, Ida.	Sept. 8	Sept. 29	0.00½
Justice, Nev.	Sept. 8	Sept. 30	0.02
Lower Mammoth, Utah	Sept. 11	.....	0.01
Lucky Calumet, Ida. (postpo'd)	Aug. 11	Oct. 10	0.005
Lucky Swede, Ida.	Sept. 20	Oct. 16	0.003
McKinley Gold, Ida.	Sept. 8	Oct. 8	0.0005
Mexican Metals (Boston)	.....	Oct. 10	0.15
Nabob, Ida.	Sept. 22	Oct. 6	0.005
Phoenix Copper, Ariz.	Sept. 20	.....	1.00
Sierra Nevada, Nev.	Sept. 25	Oct. 25	0.10
Silver Mountain, Ida.	Sept. 15	Oct. 15	0.002
Slavonia, Ida.	Sept. 10	Sept. 30	0.002
St. Louis, Nev.	Sept. 22	Oct. 14	0.01
Sunset, Nev.	Sept. 2	Oct. 13	0.01
Sunshine, Ida.	July 1	Oct. 15	0.001
Teddy, Ida.	Sept. 15	Oct. 15	0.001
Yellow Jacket, Nev.	Sept. 8	Oct. 8	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59.490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	53.043	61.290	58.990	24.486	28.215	27.199
July	52.630	60.654	58.721	24.286	27.919	27.074
August	52.171	61.606	59.293	24.082	28.375	27.335
September	52.440	63.078	60.640	24.209	29.088	27.986
October	53.340	63.471	.....	24.594	29.299	.....
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	52.304	60.835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver: London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York				London Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16.767	62.760	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16.245	15.738	72.352	68.807
June	17.234	14.672	17.443	14.871	78.259	67.140
July	17.190	14.190	17.353	14.563	76.636	64.166
August	17.498	15.400	17.644	15.904	78.670	69.200
September	17.508	16.328	17.698	16.799	78.762	73.125
October	17.314	.....	17.661	.....	76.389	.....
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.140
March	42.577	46.832	192.619	213.615
April	43.923	49.115	200.513	224.159
May	46.063	49.038	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519	40.260	202.446	183.511
August	45.857	41.582	208.351	188.731
September	49.135	42.41	223.762	193.074
October	50.077	.....	228.353	.....
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.381	4.118	4.242	16.331	17.597
May	4.194	4.342	4.072	4.226	16.509	18.923
June	4.392	4.325	4.321	4.190	17.588	20.226
July	4.720	4.353	4.603	4.223	18.544	20.038
August	4.569	4.624	4.452	4.550	19.655	20.406
September	5.048	4.698	4.924	4.579	22.292	20.648
October	5.071	.....	4.894	.....	20.630	.....
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6.483	5.491	25.644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6.727	4.974	25.763	22.143
July	7.116	5.278	6.966	5.128	26.174	20.592
August	7.028	5.658	6.878	5.508	26.443	20.706
September	7.454	5.694	7.313	5.544	27.048	21.148
October	7.426	.....	7.276	.....	27.543	.....
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15	16.31	14.38	15.13	14.38	14.74
August	15.43	16.63	14.90	15.00	14.85	14.88
September	16.86	16.78	16.03	14.93	15.63	14.93
October	17.90	.....	17.18	.....	17.22	.....
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS Sept. 30

Name of Comp.	Bid.
Acacia	.02½
Cripple Cr'k Con.	.01½
C. K. & N.	.07
Doctor Jack Pot	.02½
Elkton Con.	.55
El Paso	3.50
Findlay	.02½
Gold Dollar	.08½
Gold Sovereign	.02½
Isabella	.10
Jack Pot	.04½
Jennie Sample	.05
Jerry Johnson	.03½
Lexington	‡.005
Moon Anchor	‡.006
Old Gold	.01½
Mary McKinney	.57½
Pharmacist	.01½
Portland	.97
Vindicator	.88

SALT LAKE Sept. 30

Name of Comp.	Bid.
Beck Tunnel	‡.05
Black Jack	.10½
Cedar Talisman	.00¼
Colorado Mining	.11
Columbus Con.	.00½
Crown Point	.01½
Daly-Judge	6.10
Grand Central	.46
Iron Blossom	1.22½
Little Bell	‡.10
Lower Mammoth	.02
Mason Valley	3.25
May Day	.06¼
Nevada Hills	.90
New York	‡.03
Prince Con.	.30
Silver King Coal'n	3.50
Sioux Con.	.01
Uncle Sam	.03½
Yankee	‡.08

TORONTO Sept. 29

Name of Comp.	Bid.	Name of Comp.	Bid.
Bailey	.05	Foley O'Brien	.21
Coniagas	7.15	Hollinger	17.35
T. & Hudson Bay	‡70.00	Imperial	‡.02
Timiskaming	.23	Jupiter	.16
Wettlaufer-Lor.	.13	Pearl Lake	.27
Apex	‡.01	Porcu. Gold	.08
Big Dome	10.00	Preston E. D.	.01
Crown Chartered	‡.00½	Rea	.12
Doble	.10	Swastika	.03
Dome Exten.	.06	West Dome	.10

SAN FRANCISCO Sept. 30

Name of Comp.	Bid	Name of Comp.	Bid
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.05	Belmont	7.25
Belcher	.21	Jim Butler	.67
Best & Belcher	.05	MacNamara	.11
Caledonia	1.55	Midway	.42
Challenge Con.	.11	Mont.-Tonopah	1.20
Chollar	.03	North Star	.41
Confidence	.35	West End Con.	1.50½
Con. Virginia	.15	Atlanta	.14
Crown Point	.20	Booth	.01
Gould & Curry	.03	C.O.D. Con.	.03
Hale & Norcross	.05	Comb. Frac.	.04
Mexican	1.12½	Jumbo Extension	.12
Occidental	.70	Pitts.-Silver Peak	.38
Ophir	.23	Round Mountain	.40
Overman	.50	Silver Pick	.04
Potosi	.02	Tramp Con.	‡.01
Savage	.11	Argonaut	2.50
Sierra Nevada	.11	Bunker Hill	‡1.75
Union Con.	.11	Central Eureka	.10
Yellow Jacket	.38	So. Eureka	‡2.75

N. Y. EXCH. Sept. 30

Name of Comp.	Clg.
Amalgamated	73½
Am. Agri. Chem.	45
Am.Sm.&Ref.,com.	65⅛
Am. Sm. & Ref., pf.	100
Am. Sm. Sec., pf. B	82½
Anaconda	36½
Batopilas Min.	1
Bethlehem Steel,pf.	74
Chino	39¾
Federal M. & S., pf.	38½
GreatNor.,ore.,ctf.	34⅜
Guggen. Exp.	45½
Homestake	105
Inspiration Con.	16
Miami Copper	23
Nat'l Lead, com.	44½
National Lead, pf.	106⅜
Nev. Consol.	16½
Phelps Dodge	188
Pittsburg Coal, pf.	89¾
Quicksilver, pf.	3⅛
Ray Con.	19
Republic I&S,com.	21
Republic I&S, pf.	85
SlossSheffi'd,com.	30
Sloss Sheffield, pf.	89
Tennessee Copper	31⅛
Utah Copper	51½
U. S. Steel, com.	58⅛
U. S. Steel, pf.	108
Va.Car.Chem.,pf.	96

N. Y. CURB Sept. 30

Name of Comp.	Clg.
Ariz. Belmont	.19
Barnes King	1⅛
Beaver Con.	.33
Big Four	.20
Braden Copper	7⅛
B. C. Copper	2⅛
Buffalo Mines	2⅛
Can. G. & S.	.19
Con. Ariz. Sm.	1 1/16
Davis-Daly	2½
Diam'field-Daisy	2
Ely Con.	.07
Florence	.20
Giroux	1 1/16
Gold Hill Con.	1/16
Goldfield Con.	1⅛
Greene Cananea	.30
Greenwater	.04
Internat. S. & R.	‡115
Kerr Lake	4 1/16
Keystone	‡1⅛
La Rose	2⅛
McKinley-Dar-Sa.	1 1/16
Min. Co. of A. new	2⅛
Nipissing Mines	8⅛
Ohio Copper	1/16
Pacific Sm. & M.	⅛
Puebla S. & R.	2⅛
South Utah M&S.	1/16
Stand'd Oil of N.J.	378
Stewart	1⅛
Tonopah	4 1/16
Tonopah Ex.	1 1/16
Tonopah Merger	.72
Tri-Bullion	⅛
Tularosa	.50
Union Mines	.04
United Cop., pfd.	3
West End Ex.	.06
Yukon Gold	2

LONDON Sept. 20

Name of Comp.	Clg.
Camp Bird	£0 15s 9d
El Oro	0 14 6
Esperanza	1 0 0
Mexico Mines	6 0 0
Oroville	0 8 3
Santa Gert'dis.	0 18 9
Stratton's	0 1 6
Tomboy	1 6 3

BOSTON EXCH Sept. 30

Name of Comp.	Clg.
Adventure	1½
Ahmeek	280
Alaska Gold M.	22½
Algomah	1½
Allouez	36
Am. Zinc	19
Ariz. Com., ctfs.	4⅛
Bonanza	.32
Boston & Corbin	.75
Butte & Balak.	2½
Calumet & Ariz.	66½
Calumet & Hecla	435
Centennial	14
Cliff	1½
Copper Range	40
Daly West	2
East Butte	12
Franklin	3½
Granby	71½
Hancock	17
Hedley Gold	‡30
Helvetia	.45
Indiana	4
Island Cr'k, com.	51
Island Cr'k, pfd.	84
Isle Royale	19½
Keweenaw	1½
Lake	8½
La Salle	3½
Mass.	2
Michigan	1½
Mohawk	42½
New Arcadian	2
New Idria Quick.	2⅞
North Butte	27½
North Lake	1½
Ojibway	.75
Old Dominion	51½
Osceola	78
Quincy	‡63
Shannon	6¼
Shattuck-Ariz.	28
Superior	25
Superior & Bost.	2⅛
Tamarack	31
Trinity	4½
Tuolumne	.60
U. S. Smelting	40½
U. S. Smelt'g, pf.	47½
Utah Apex	2⅛
Utah Con.	9
Victoria	1 1/16
Winona	1½
Wolverine	43
Wyandot	.50

BOSTON CURB Sept. 30

Name of Comp.	Bid
Bingham Mines	5⅛
Boston Ely	.60
Butte&Lon'nDev.	.31
Cactus	.02
Calaveras	1½
Chief Cons.	1⅛
Corbin	.75
Cortez	.30
Crown Reserve	1 1/16
Eagle & Blue Bell	.95
First Nat. Cop.	2 15/16
Houghton Copper	3½
Majestic	.31
Mexican Metals	.32
Moneta Porc.	‡.07
Nevada-Douglas	2⅛
New Baltic	.60
Oneco	.80
Raven Copper	.08
Rhode Island Coal	.01
Smokey Dev.	1
So. Lake	3½
S. W. Miami	1½
South Lake	3½
Trethewey	.28
United Verde Ext.	.51

‡Last Quotation.